SCHOOL OF WISDOM AND ARTS:

Being a

Complete Repository of what is most Curious in Art and Nature.

CONTAINING.

I. A Survey of Man, with fublime Reflections on his most noble Part, the Soul.

II. A particular Description of the Structure of the Human Body; and the wonderful Properties of the Eye described.

III. Astronomy, Oratory, Politeness, and Morality. IV. A Review of the Creation, viz. Birds, Beafts, Fishes, and Infects; their Industry, Sagacity, &c.

V. Of the Globe; Gravity, Air, Light, Sound, Water, Clouds, Rain, Hail and Snow, with their Properties and Use.

VI. Nations compared with each other.

VII. Drawing, Painting in Water and Oil Colours: Gilding, Etching, Engraving, Painting upon Glass, and Bronzing.

VIII. Dying Silk, Linnen, Woolen and Leather.

X. Impressions from Figures, Busts, Casts, Medals, Leaves, &c.

K. The Arts of Painting Marble and Glass; of Staining Wood, Bones, Horn, Ivory, Paper, Parchment, &c.

II. The whole art of Pyrotechny or Fire-works.

KII. The Art of making Porcelain after the Chinese manner, with many curious particulars, equally amufing and inftructive to the Ingenious.

Compiled from different Authors.

BERWICK:

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INTRODUCTION.

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NOW THY SELF! was an Infcription over the Gates of one of the most famous Temples of the Heathen world; and it has been ever fince admired for the great importance of it, and its vast fignificency, though expressed in so few words. Let us follow this fage advice, by confidering what we are, and what is around us. Let us open the Eye of the Mind, as well as those of the body; and, whilst the one is charmed with beholding, let the other be no less so, with contemplating, THAT ALL IS GOOD AND WISE. For, what is MAN without Education? like Marble in the Quarry, till the Skill of the Polisher makes the Surface shine, and discovers every ornamental Cloud, Spot and Vein, which runs through the body. Instruction, when it actuates upon a Noble Mind, draws out to View every latent Virtue and Perfection. The Senator, Philofopher, and Mechanic, very often lie concealed in persons of low condition in life, which a proper Education might have difinterred, and brought to light. The Human Mind always repays us with Usury for the care we take to cultivate it: it is a Soil that is Rich and Fruitful, capable of the most Noble Productions--therefore worthy of our Care. Finally, Instruction dispels the Cloud of Ignorance, enlarges the Mind, extends its Views, multiplies its Ideas, and opens to it New Scenes of Pleasure, which those that want Education can never enjoy. And, as Wisdom and Virtue are essential to our Happiness; Practice well what Wisdom dictates, and Virtue shall reward you.

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CHAP. I.

Of the Soul of MAN.

A S the Soul of Man is his most noble part, being: a copy of the Divine Image in us, in which we ave enough to fill us with admiration of the munifience, wisdom and power of the infinite Creator, then we contemplate the noble faculties of this our uperior part, the vast reach and compass of its unterstanding, the prodigious quickness and piercingels of its thought, the admirable subtility of its inention, the commanding power of its wifdom, and he great depth of its memory, we must be astonish. ed at the immense power of that Wise Being, who ormed every part of this grand creation. There are two things we cannot easily pass by, because they maifelt the special concurrence and design of Providence, as having a particular and necessary tendency to the management and good order of the affairs of mankind in general. How various are the inclinaons of men to different bufinesses; we see how namrally they betake themselves to this and that emdoyment; some delight in divinity, some in physic, natomy, and botany, some in critical learning, and hilology; others in mathematics, metephysics, arhitecture, war, navigation, commerce and agricul-

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ture, while many more are busied in the servile offices

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Now all this is necessary, for the more easy transacting the affairs, foreign or domestic, of almost every individual of the human species; to answer every end and occasion of man; to make him useful even to the poor helpless beasts, as far as his help is needful to them; all without any great trouble, fatigue, or inconvenience; but rather as a pleasure and diversion to him; for so far is it from being a toil, that the greatest labours, cares, and dangers become pleasant to him who is pursuing his genius; whose ardor eggs him forward, and buoys him up under all opposition, and carrieth him through every obstacle, to the end of his designs and desires.

In the next place, it is highly worth our observation to note the inventive power of the soul; to shew how astonishing it is, that it should hit upon every thing that is, or may be of use to himself or society, in which he has such extensive interest and concern. For the illustration of this, we shall take a cursory view of the arts, sciences and trades, and the very tools they perform their labours and contrivances with, which are numerous as their various occasions

require.

What is there that falleth under the inspection of man's senses, that he doth not employ to some use or purpose, for either private or public good! The celestial bodies, the sun, moon, and other planets, he employs to the noble purposes of astronomy, navigation, and geography. What an abundant mass of knowledge must the soul be endowed with, to invent the useful sciences of geometry and arithmetic, both specious, and in numbers; and those nice and various instruments, made use of by the geometrician astronomer, geographer, and sailor! What wonders say in the late invention of the telescope; wherewith new wonders are discovered among God's works, in the heavens, as there are here on earth, with the

microscope and other glasses! And as for this lower world, what material is there to be found; what kind of earth, stone or metal; what animal, tree or plant, and the very shrubs of the field; in a word, what, of all the excellent variety of things the Creator has furnished the world with, for all uses and occasions, in all ages, that man's contrivance doth not extend unto, and make some way or other advantageous to himself, and useful for building, cloathing, food; physic, tools or utenfils, or even only for pleasure and diversion! But now considering the power and extent of human art, there are other things which further demonstrate the superintendence of the Great Creator; and we find, that things of great and abfolutely necessary use have soon, and easily occured to the invention of man; while those of little use are rarely and flowly discovered, if ever.

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We have as early as the Mosaic history an account of the invention and progress of the more useful ocsupation: thus (Gen. iii. 23. Adam was sent forth from the garden of Eden, by God himself, to cultivate the earth; and in the next chapter his two fons Cain and Abel were differently employed, Cain was a tiller of ground, the other a keeper of sheep. Jabel was father of such as dwell in tents, (Gen. iv.) that is, he was the inventor of tents. Tubal Cain was an instructor of every artificer in brass and iron, or the ark that found out the art of melting and malleating metals, making them useful for tools, and other necessary implements; his fifter Naamah is also said to have invented spinning and cloathing. Yea, the very art of music is thus early ascribed to Tuba, (Gen. iv. 21.) to indulgent was the Creator to find means to divert melancholy, to cheer the spirits, and to entertain and please mankind. We may learn from hence, that matters of less concern, and those of dangerous consequence, were for our instruction, left exercises of the wit and faculties of men.

What an excellent property of the foul is the memory, what a vast variety of things does it retain!

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Though-we are every day crowding it with fresh objects, yet it still preserves those committed to it many years past; who can comprehend where it lays up all these things? by what means doth it retain, and keep them separate and distinct, so as not to confuse each other? it holds a multitude of actions within its narrow compass, and yet presents to us each fingle one distinct and clear, whenever we have occasion to recall it. It is a guardian and trustee of all we see, hear, read, and of all that our own reflections teach us: Itis a domestic and natural treasure of exquifite value: the monuments of the history of nations have bounds, but the memory of man has none; it joins one history to another. What it has once admitted in good order (especially when it retains any object with the strong ties of reasoning and pleasure) is a deposition it preserves for us all our lives. What is most to be wondered at, is the perspecuity that is maintained among these images, which no length of time, nor change of fituation, can possibly efface or embarrafs. If we are shewn the picture of a man we have not feen for twenty years together, it is a doubt but we immediately find many faults with it, yet probably do not think it altogether unlike the original; that the mouth is too wide, the turn of the face is too much upon the round, and that the eye is too full and looks fad. Those who have lived with the man we speak of, will find our judgment is right; but where is the voucher that can authorize this cenfure? it is another more faithful and indelible portrait, which the bare fight of that man has left in the memory, and which a million of other pictures could by no means hinder from distinguishing directly. It is that enriching faculty the memory that fo feafonably supplies us with the discoveries of the greatest genius's in every age; with the ravishing ftrokes of the most eloquent orators and ingenious poets; the reflections of men deep in penetration, whom a long experience has made perfect; in short, with whatever they have been able to collect, in confequence of their own remarks, or by means of others.

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We experience in our memories a kind of convenience, never met with in any common magazine; in the latter we are obliged to refer to some particular mark or number in order to produce the matter contended for; whereas with the memory it is the reverse, for if we want to recollect any thing, the ideas themselves offer their service; that which immediately concerns him, after it has ministered to him, difappears in his turn, though still ready to shew itself again upon every new command. When we confider what amazing things many men have done, we can to less be allowished at the excellency of our nature; what a vast capacity did it require, to discover the mode of expressing every meaning and thought of our minds, by the use of twenty-four characters or etters; and to express all numbers by the applicanon of only ten figures!

If we consider some men in particular, we shall be no less astonished King Mithridates made himself inaster of no less than twenty-two different languages; the samous Origin composed no less than six thousand books; Pliny, in collecting his natural history, consulted above two thousand different authors; the nemory of Cyrus was so great, that he called every man in his prodigious army by his right name; Seneca could repeat two thousand names, in the exact order they were spoke, only once hearing them; Leonardo de Vince, by the assistance of an extensive memory, made himself so great a proficient in his profession of history and painting, that none ever went before him; and yet he was skilled in sculpture, architecture, ma-

mematics, mechanics, &c.

Who but the Omnipotent could make such a dine substance, endowed with those admirable facules and powers, as the rational soul hath? a being fashioned as to bear the Creator's vicegerency in his lower world; to employ the several creatures; make use of various materials; to manage the

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grand bufiness of the creation; and to survey the glories of all the visible works of a God! a creature, without which this lower world would have been a dull, uncouth desolate globe: who, or what less than the infinitely wife Being, could form fuch a rational creature, such a divine substance as the soul! for suppose we should allow the atheist any of his nonsenfical schemes, the epicurean his furtuitous concourse of atoms, or the cartesian his created matter put in motion; by what means could he, in his way, produce such a divine substance, endowed exactly with fuch faculties, powers, and dispositions, as the various occasions of life require from such a creature! Why should not rather all the arts, the dispositions and ingenuities of men, if made by a mechanical process, and not by the Deity, have been more nearly alike? particularly, why should not each have thought upon every advantage of equal use, as another, many ages fince? What could not man have effected in this as well as fome thousand years after? why also flould not all nations and all ages improve in every thing as well as this or that age, or nation only! Why should the Greeks, Arabians, Persians, or Egyptians of old, fo far exceed those of the same nations, at this late period? How could it come to pass, that the use of the magnet, the art of printing, making clocks, the invention of telescopes, and a great number of other artifices, should escape the discovery of Archimedes, Anaximenes, and many more celebrated virtuofos of the early ages, whose contrivance of various engines, spheres, and other curious instruments are recorded? Why cannot the past (or the present) age, so eminent in the different branches of polite learning, for improvements in all arts, (per haps excelling any age of the known world) discover those hidden quaesita, which may probably be referre ed for the discovery of future and less learned gene rations? Of these weighty matters, no satisfactor account can be given by any mechanical hypthesis, of other form, without taking in the superintendance of

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the universal Ruler of the world, who manifests himless sufficiently in the most considerable works of men, by numberless instances of his unexampled goodness, or by some remarkable transaction of his providence, set forth as a token of his love for the soul.

Let us therefore follow the advice of Solomon, (Eccl. ix. 10.) Whatfoever thy hand findeth to do, do it with all thy might; lay hold on every occasion that presents itself, and improve it with the utmost diligence: because, now is the time of action, both in the employment of the body and of the mind, now is the season of studying either arts and science, or wisdom and virtue; for which we shall have no opportunity in the place whither we are going in the other world; for there is no work, nor device, nor knowledge, nor wisdom, in the grave whither thou goest.

CHAP. II.

A particular Description of the HUMAN BODY.

WE have perhaps possessed a body for a number of years, and yet not once thought what a wonderful composition that body is. We eat, drink, seep, draw in the breath of life, feel our blood circulate, walk, stand still, lie down, rise again, speak with our tongue, hear with our ears, see with our yes, smell with our nostrils, taste with our palate, seel all over our body, and probably not once relected, how admirable all these are, and what a rand display of judgment has been shown in forming and disposing them for use; and still what a subject for resection is here!

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How furprifingly curious is the ftructure of mans body; what a pleasing variety of the most exquisite modes of workmanship are exhibited in this moving machine of ours, where all the parts are so exactly correspondent, as to answer the great purpose which they originally were intended for! What a commodious posture for a rational creature is the erect pofition of the body of man; for without this form, he could not readily have turned himself to perform his various necessary offices, much less to exercise his faculties among the curiofities of nature and art. His hand, particularly, could not have been in fuch great readiness to execute the commands of the will, and dictates of the foul; his eyes would have been the most prone to danger, and incommodiously situated of all animals; but by this fituation, he can cast his eyes upwards, downwards, and round about him; he hath a glorious hemisphere of the heavens, and an ample horizon on earth, to entertain his eye.

The figure and shape of mans body is the most commodious that possibly could be devised for such an animal: the most agreeable to his motion, to his labours, and all his occasions. For had he been a rational reptile, he could not have moved from place to place, fast enough for his business: had he been a rational quadrupede, among other things he would have lost the benefit of his hands, those noble instruments of the most useful performances of the body. As in the figure, so in the stature and fize of man's body, we have another manifest indication of Excellent defign: that is, not too pigmean, or gigantic; either of which proportions would have been very inconvenient, both to himself and his business, or to the rest of his fellow-creatures. Too pigmean would have rendered him too puny a lord of the creation; too impotent and unfit to manage the inferior creatures: besides, he would have been exposed to the affaults of the weakest animals, to the ravening appetite of voracious birds, and endangered his being trodden to death by any animal of greater bulk than him-

eif. On the other hand, had man been enormously igantic, it would have given him an opportunity of xecuting the greatest acts of tyranny; and perhaps night have been too strong in some respects, even for his own kind, as well as others. Locks and doors night have been made of sufficient strength to baricade our houses, walls and ramparts strong enough o defend our cities; but these things could not have been performed without an enormous and inconvenient expence of room, materials, and fuch necessaries s fuch large fiructures would require; more, undoubtedly, than the world could have afforded to all ges and places. No other cause can be assigned why man was not made bigger than he is, but his relation to the universe.

What a noble fituation is that of the head, which placed as on an eminence, being the most proper fation possible for the repository of the four senses. three of which we shall chiefly describe: the fourth, namely the eye, being endowed with fo many excellent properties, we shall treat of that curious organ of the human species separately from any other sub-

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The fense of hearing is deposited in the most conenient part of the body, near the common fenfory the brain; to give the more speedy information; in part where it can be best guarded, and where it is oft free from annoyances and harms; and where gives the least hindrance to the exercises of any other power; in a place appropriated to the peculiar ale of the principal senses, in that lofty eminence. where it can receive the most intelligence, and judge with the nicest observation. There is a discreet poron of the Creator's providence in the substance of the outward ear, which is hard and horny; if it had been bone, it would have been troublesome, and liaf sole by many accidents to break off; if flesh, it would pe- ten have been subject to contusion, and would neiod- er have remained suspended, nor so kindly receive im- and circulate the founds, but absorb, retard, and

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blunt their progress into the inward organ; but being hard, and curiously smooth and tortuous, sounds find an eafy passage, with a regular volutation and refraction; as in a well built arch, grotto, or musical in-Arument, which magnifies and meliorates founds; and some of which convey even a whisper to a greater distance. The hearing is always open, it is a fense we need even while we are sleeping; for if any found enters, we awake. If the passage into the ear had been straight, the found would diffipate and escape before the sense could be affected; and, to prevent the invasion of noxious insects, nature hath secured this passage with a bitter nauseous excrement, afforded from the glands appropriated for that purpofe. There is also a special contrivance of the nerves, ministring to this sense of hearing, which may not be unworthy of notice : and that is, the branches of ad one of the auditory nerves, spread partly to the muscles of the ear, the eye, the tongue and instruments of speech, which are innoculated with the nerves the to go to the heart and breast; by which means there of is an admirable and useful confent between those Th parts of the body, it being natural for most animals, an upon hearing any uncouth noise, immediately to erect their ears, and prepare them to catch every wh found; to open their eyes (those constant faithful nat centinels) to stand upon their watch; and to be ready dri with the mouth to call out or utter what the present ed occasion shall dictate, to guard them from external condangers. There is besides this in man, another great of the persons commerce between the ear and use in the nervous commerce, between the ear and oth the mouth; that the voice may correspond with the sa hearing, and be a kind of echo thereof, that what is or heard with one of the two nerves may be readily exercised. pressed with the voice by the help of the other.

As the sense of smelling is particularly useful, I no shall make a few remarks on that subject, which may wo suffice, because its apparatus (although sufficiently om grand and admirable) has not fuch a multiplicity of perfections as the eye and ear; it being sufficient in

this sense, that the odoriferous effluvia of bodies can have a free passage to the olfactory nerves, without the formalities of refraction, and other preparations necessary for the perfection of the two former senses. Accordingly the beneficent Creator hath made fufficient provision for the reception of smells, by the aperture of the nostrils; made not of flesh, or bone, but cartilaginous, the better to be kept open, and withal, to be dilated or contracted, as there is occafion, and for which purpose it hath several curious and proper muscles. The nostrils are placed high, vent because all scent ascends, and have, with great reason, a near vicinity with the mouth, as they assist us in judging of meat and drink, and are ever partly open; there is another excellent property in the lower part of the nose; being easily moveable, having a set of muscles to lift-up, open or shut the nostrils, and so es of adjust it to every occasion of sense, as far as is rethe quisite: and as a farther guard against the ingress of noxious things, hairs are placed at the entrance of the nostrils, which in some measure stop the entrance of things improper, or at least give warning of them. They have also a humidity necessary for repelling dust and other extraneous bodies.

The taste, which is to distinguish the quality of every what we take, is in that part of the mouth where ithful nature has laid open a passage for what we eat or ready drink. The all-wise Creator seems to have establishrefent ed a great consent between the eye, the nose, and ternal ongue, by ordering the branches of the same nerves or and other parts of the same body, by which means, there is all the guard that can be against pernicious sood; but is or before it is taken into the stomach, it must unsily except the trial of three of the senses, viz. the scrutiny of the eye, the strict surveyor of its outward appearance, and the probation of the smell and taste, the she may we severest judges of its natural constitution and ceiently of the eye.

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What a variety of uses hath nature laid upon that active member the tongue! the grand instrument of taste, the faithful judge, the centinel, the watchman of all our nourithment; the artful modulator of our voice, the necessary servant of mastication, sucking,

fwallowing, and various other uses.

What an instance of contrivance in our bodies that the fense of feeling is placed in no particular part, but equally diffused through the whole structure, that we may not receive any blows or too rigid attacks of cold and heat, without being fensible of them, and fo be warned to defend ourselves. This sense of feeling is performed by nerves, spread in the most curious manner, throughout the whole body. the fenses of animals we have a wife œconomy, worthy of the Creator, openly demonstrating his power, wisdom and indulgence. As the offices of respiration are necessary to our existence I shall just mention one prodigious work of nature, and that is the circulation of blood in the fætus in the womb, so different from the method thereof after it is born. In the womb while it is one body with the mother, and hath no occasion nor place for respiration, there are two pasfages on purpose for the transmition of the blood without passing it through the lungs; but immediately after the feetus is born, and thereby becomes perfect distinct being, these two passages are shu up; one nearly obliterated, the other becomes a li gament: What is thought and contrivance, if this be not? namely, that there should be a temporary part of the body, made just for the present exigence, to continue whilst there is occasion for it, and to ceal when there is none.

How excellently we are defended against injury in the throat or gullet, as the passage for the entrance of the air we breath into the lungs is placed near that whereby we swallow our food: What imminers danger should we be in by every morsel of nourish ment we take, in stopping our breath, had not Good (whose goodness extends to the minutest particular

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ev ex Th made a little lid or cover over the passage through which we receive our breath, which constantly shuts down of itself; and with such wonderful exactness and care does it execute its office, though we have occasion for it ever so often, it has rarely, if ever been known, that any accident has happened to mankind this way.

Again, what provision there is made in the stomach for digesting our food, and to make it nourish the whole body! how amazing the perpetual motion of the heart, which drives the blood to every part of the body; for if it ceases one moment, life would be immediately extinguished! What matter of surprize do they find who have seen a human body diffected! to see what a vast number of inconceivable sine veins and arteries are there contained that sustain the interior parts of such a noble edifice! What infinite wisdom is shewn in the continual play of the lungs, which alternately dilate and contract, to receive and return the air we breathe.

We shall pass by the particular conformation of many parts (the ligaments and fastenings) the better to complete our design, for instance, of the perecardium to the diaphragm (which is peculiar to man.) As an explanation would take up more pages than this treatise will admit, the variety of subjects considered, and those technical terms little understood by some of our readers, therefore we shall proceed to describe as before, such parts of the human structure, as shall display the wisdom of God in so intelligent a manner, that the meanest capacity may both understand and admire.

Let us next examine the curious fabric of the bones, those pillars of the body, how artificially made: What so commodious a texture could have been given them, to be so firm, strong, and light? Who could have shaped them so neatly, and adapted them to every part, to be of such use; made them of such exact lengths, given them such proper sizes, and shapes; channelled, hollowed, and headed them in

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so complete a manner? How artfully are the joints contrived to render our limbs pliant and fit for every motion, their bandage keeping them from luxation; the oily matter to lubricate them, and their being fo smooth, that notwithstanding their being in use for fifty years, they are not injured by fo long and nearly a perpetual motion. How curiously placed are the bones from head to foot! the vertebra of the neck and back-bone made short and complanated, firmly braced with muscles and tendons for easy incurbation of the body; but withal for greater ftrength to support its own weight, together with other additional weight it may have occasion to bear. The thighbones long, of great strength, and every way well fitted for the various motions of the body. The feet are accommodated with a great number of small bones, curiously and firmly tacked together; to which also must be added the assistance of the muscles, to answer all the motions of the legs and thighs, and at the fame time to keep the body upright, and prevent its falling, by readily affifting against every vaciliation thereof; and with frequent and easy touches it keeps the line of innexion and centre of gravity in due place and order. And as the bones are adapted to prop, fo all parts of the body are as incomparably placed to poife it, not one fide too heavy for the other, but all in a just equipoile: The shoulders, arms, and fides equilibrated on one part; on the other, part of the viscera of the belly counterpoised with the weight of the scapular part, and that useful cushion of slesh behind. To all this we may add the wonderful concurrence and ministry of the prodigious number and variety of muscles, what service they are to us in running, leaping, dancing, and every

Next, let us confider the lodgment of the curious parts of man's body, which is no less admirable than the parts themselves, all set in the most convenient places, in order to accomplish their own several purposes and designs, mutually to assist and help each

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pints other. Where could the eye, the ear, and tongue be so commodiously fixed as in the head, so near the brain, a part well guarded, and of little use than to g so be a seat to those senses? Where could we place the for hand to be so useful on every occasion, but just where tear it is? There is a very curious particularity in the the hand which renders it of great utility to man, viz. neck the difference in the length of the fingers; for by this contrivance, when we grafp any thing of a large tion circumference, the ends of them come to an equal fup. length, whereby we are enabled to take firmer hold; onal they are equally ferviceable in holding small things between our fingers, which otherwise would have been apt to flip away. These and many other infeet conveniences should we have experienced, had our fingers been formed otherwise than as they are. And fuch is the flexibility of our joints, that the fingers are closed and opened without any difficulty; fo that by their help the hand is enabled to perform all the offices of life; for it is with the hand we till the ground, plant trees, build houses and palaces, and fetch from all parts of the world every commodity of life.

Where could we lodge the heart, but in or near the centre of the body; where find room for that noble engine to play freely in, guarded as it is against ders, external harms, but in the very place where it is fo well secured? Is it possible to fix all the arteries and oised veins to convey nourishment, and the nerves senfation, throughout the body, in a better manner than their present situation will admit of! The most magnificent and ingenious pieces of mechanism that ever were invented by human art, are far inferior to this fingle structure. Where could we fet the legs or feet but where they are, to bear up and handsomeby carry about the body? What covering, what fence could we find out for the whole frame, better than that of Nature's own providing the skin? How could we shape it to, or brace it about every part of us each either better for convenience or ornament? What better texture could we give it, which, although less obdurate and firm than that of some other animals, yet is so much the more sensible of every touch, and more compliant with every motion, whether circular, direct, violent, swift or slow? And being easily defensible by the power of man's reason and art, is therefore much the properest tegument for such a reasonable creature.

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Here we might have put an end to our observations relating man, but that there still are three things fo expressly declaring the Divine management and concurrence, and being of fo important a nature to man, that we cannot omit mentioning them (although more amply taken notice of by others) and that is, the great and ferviceable variety throughout the world of mens faces, voices, and hand-writings. Had man's body been made according to any of the atheistical schemes, or any other method than that of the Umnipotent, this wife variety would never have been; but mens faces would have been alike, and cast in the same, or not a very different mould; their organs of speech have sounded the same, or not with so great variety of notes; and the same structure of muscles and nerves would have given the fame direction in writing. In this case, what confusion, disturbance, and mischiefs, would the world continually have lain under! No fecurity to our persons, no certainty not enjoyment of our possessions; no justice between man and man; no distinction between good and bad, of friends or foes, father and child, husband and wife, male or female; but all would have been exposed to the malice of the envious and ill-natured, to the fraud and violence of knaves and robbers, to the forgeries of the crafty cheat, to the lust of the esseminate and debauched! our courts of justice can abundantly teltify the dire effects of mistaking mens faces, of counterfeited hands and forged writings. But now, as the infinitely wife Creator and Ruler hath ordered the matter, every man's face distinguisheth him in the light; his voice in the dark, and his hand-writing less

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an speak him sufficiently though absent, and be his witness and secure his contracts to suture generations: clear demonstration of the Divine superintendance and care.

Lastly, Whether we consider the bare mechanism of the organs, or the use and convenience of each sense and faculty, we find it noble, grand, curious, and artificial; every way worthy of its beneficent maker, and beyond the wit and power of any thing but a God.

ET us now consider that noble organ of sense the eye; which (says a celebrated anatomist) for its excellence, may be called the miracle of the Creator.

Among the principal parts of the body which shew the wisdom of God, none is found that shines with greater grandeur, or more elegance and beauty than the eye, which seems to have a peculiar care and distinction bestowed upon it by the Divine Being, and displays the highest marks of his stupendous power. The learned have declared, that nothing can be added thereto or alteration made, either for beauty, safety, or usefulness.

To enumerate all the wonders of the eye would fwell this treatife to an enormous fize, therefore we shall endeavour to explain its admirable properties in such a manner as an ordinary capacity may understand, and the most learned admire.

This magnificent structure is entirely disposed according to the nature of light. It is certain that we see no object, but by its being drawn by the rays of light reslected from it, on a very fine skin, which is placed at the bottom of the eye, called the retina: upon this thin membrane or skin, the light of pictures inimitably, the image of the sun, moon, stars, or

whatever object we look at, are represented in their true colours and lineaments. But who can conceive how this is to done? that a multitude of different objects should all be pictured at the same time, and each distinctly within the small compass of the eye! and yet this is a fact, though beyond our comprehension. Let us but examine and resect, and we must admire the enchanting prospects we behold from eminences; of hills and vales, fields, trees, rivers, woods, and other objects, minutely drawn within the narrow limits of this curious fabric.

The humours of the eye are particularly fuited for the purpose of drawing together the rays of light; for when they enter the eye, they meet with a fine humour, called the aqueous or watery humour, because it is in all respects like water, except that it will not freeze even in the greatest frosts. In going through this humour (such is the property of it) the rays of light are turned out of the course they were going in, and brought nearly together, till they come to the fecond humour of the eye, called the crystal. line humour, which is a transparent folid substance, convex or projecting outwards on both fides; which unites all the rays on the bottom of the eye: Experience shews, that this form is the properest for uniting rays of light into one point. Thus we find that a flat piece of glass has no power to unite the rays of light, but if the same glass is ground convex, (like glasses of spectacles) we find it will gather the rays into one certain point, and represents the exact image of all objects that are before it; fo that by the help of a glass ground convex, or even a common spectacle-glass, we may see exactly how every thing passes in the eye, how curiously it is contrived for the purpole it was intended, and how fight is performed. To do this, we need only make any chamber that has a prospect before it as dark as we can, then cut a round hole through the window-shutter something smaller than the circumference of a spectacle-glass; then (the case or sash being open) place such a glass

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xactly before and close to the hole, taking care that he light has no other passage into the room; then if you hang a white cloth or sheet of paper upon the wall at a proper distance from the glass, so that the rays proceeding from every point of the objects, may ach of them be collected into its correspondent point, ou will perceive the image of every thing without he chamber will be painted in the most perfect manner upon the cloth or paper, according to all its inaments and colours, especially if the sun happens o thine upon the external objects, and the glass be n the shade; for instance, when it happens that the un is in the fouth, and the window in which the lass is stands towards the north, so that none of the uns rays come directly upon it, it will be necessary o move the paper or cloth near to, or further from the window, till it is brought to the exact distance where the rays meet in a point, then every object on it will appear perfectly clear and distinct. method justly explains the nature of the eye; the hole in the window-shutter represents the pupil, the chrystalline humour performs the same as the speccacle-glass placed before the hole; the dark room is true representation of the cavity in the eye, and the retina or thin membrane which is placed at the botom of the eye is for the same purpose, and receives the images of all objects that come before it, just in the same manner as the white paper or cloth receives the images of all objects that come before the glass. By way of experiment, take the eye of an ox new-

by way of experiment, take the eye of an ox newly killed (while it is warm) and placing it before the
hole of a dark chamber, instead of a spectacle-glass
and it pictures the images on the paper in the manner as before described: they who have time to exanine it nicely, may see the objects painted on the
etina of such an eye, in the same manner as they
are upon the paper; this last experiment requires
kill and trouble, which the first shows equally as
lain. Thus we find a slat piece of glass will have
no effect, and that the moment the convex or spec-

tacle-glass is taken from the hole, no distinct objects appear on the paper: in the same manner, had the fight been flat instead of convex, or had not there been that double convex substance called the crystal. line humour in it, though the eye had remained the fame in all other respects, yet it would not have distinguithed any thing fo clearly; and to preferve this convexity fo necessary to fight, God not only made the eye of a convex form, but placed in it a transparent fluid, called the aqueous or watery humour: which, besides refracting or bringing together the rays of light, fills out the fight of the eye, making it of a convex form. This humour is so very necesfary and there is fuch a fufficient quantity, that if by any accident of a wound or puncture made in the eye it is entirely let out or loft, nature supplies it again, fo as to restore fight to the eye.

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Galen relates of a boy whose eye was so wounded, that the aqueous humour was quite lost, whereby the convexity of the eye became flacid; but yet he, after

fome time, recovered his fight.

It was not only necessary that the eye should be convex, but that it should be so to such a particular degree and no farther; for if it be too much fo, it gathers the rays of light together before they reach the retina, and confequently can imprint no image there, or a very indistinct one; and we find that an eye of this fort cannot fee any thing at a distance, therefore fuch are called short-sighted, because they are obliged to hold what they fee at a small distance from their eyes, that the rays of light reflected from it may not be gathered into a point, till they reach the bottom of the eye. For objects afar off, they use a glass ground concave or hollow on the inside, which has a very different effect from spectacle-glaffes, for inftead of gathering the rays of light together, it scatters them, and by that means lessens the essects of the too great convexity of the eye.

There are yet remaining many remarkable peculiarities in the eye, necessary to be explained; one ecls

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is, though all the limbs, muscles, nerves, arteries, veins, and most other parts of the body, grow continually till the state of manhood is attained, yet the crystalline humour never grows, but always preserves the same size and form, both in men and children.

The pupil of the eye is not only formed of that due and exact demension sittest for sight, but (which is still matter of higher astonishment,) that as we have occasion to see objects, sometimes in a greater, sometimes in a lesser light, in order to admit more or sewer rays, according as will best serve our sight: if the light be too great, it becomes smaller in order to exclude what is superstuous; but if the light is too faint, or the object we look at is at a distance, it becomes larger, that it may take in a greater number of rays in proportion.

That this enlarging or lessening the pupil of the eye is not owing to our own judgment or will, we may be convinced of, by placing a candle before the eyes of an infant; when we may observe, that the pupil of the infant's eye will contract of itself, or become less, in order to exclude the too great light; but let the candle be withdrawn, or removed aside, we will find the child's pupil by degrees to become larger; but let it be withdrawn to a still greater distance, and the pupil will then be enlarged to its utmost extent.

Another thing worthy our observation is, though the whole eye is encompassed with a membrane or kin which is not transparent, therefore will not admit the rays of light to pass through it, yet that directly over the pupil of the eye (and only there) is a most delicate, bright, and exceeding transparent membrane, beyond the clearest glass, in order to afford a free passage for the light to penetrate to the cavity of the eye, which is blackned or coated with a dark tegument, that the rays of light may be there absorbed and suppressed, and not reslected back to consound the sight.

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That none of the humours of the eye are tinctured with any colour is remarkable, and this, however infignificant it may appear, is a very wife precaution: for had the humours of the eye been tinctured with any colour, every object looked at would appear of the fame cast; as we find, that whatever is looked at through a coloured glass appears of the same colour as the glass itself; and to those whose eyes are tinged with the jaundice, all objects appear of a yellow hue. Besides these, it is proved by experience, it that a coloured body is not sit to admit the rays of the light; therefore, had the humours of the eye been of any colour, many of the rays of light that proceed the from the object looked at, would have been stopped on before they could reach the retina or bottom of the eye, where the image of the object must be formed king or preferve this spherical, or roundish sigure of the eye, so necessary for our delight, there is provided for another humour in it, which is called the vitreous and the street in the eye, so necessary for our delight, there is provided for another humour in it, which is called the vitreous and the eye, so necessary for our delight, there is provided for another humour in it. another humour in it, which is called the vitreous or glassy humour; it is very clear and bright, much like eye the white of an egg, and is in greater plenty that wheither of the other humours; it is placed behind the wincrystalline humour, and fills the whole cavity or dark of chamber of the eye; this it is that makes it of a state of the eye; this it is that makes it of a state of the eye; spherical form, and ever preserves it so: it also serve eye to keep the crystalline humour always at a proper dif ma tance from the retina, which receives the images of me all objects.

It is admirable to behold how very fine all the two wh nics or membranes of the eye are, and yet of fo fire to a texture as to be able to contain fo many differen Du humours, and to perform so many different actions are without scarce ever being injured by such constant use and so careful has the Creator been, that his creature results that he can be and useful fense, no animal hath less than two eyes, each of which singly can be perform all the offices of sight, that, if one should by any accident be injured or lost, the other might was supply its place; an advantage experienced by numbers to this day, for we find many have the misson he tured rune to lose one, and yet notwithstanding being de-er in prived of such a member, enjoy nearly the same be-tion; hefit of sight as they before received from both.

There is another curious particular the wifest men can of annot in the least account for, which is, that though the image of every object is actually pictured on the retina of each eye, whilst we have two, yet we do not see the object double, but just the same as is we were to look at it only with one eye: Let us shut ence, either eye whilst we are looking at any object; we get it still the same with the other; let us open them both, it, makes no difference. How there should be occed two pictures formed, and yet we be sensible only of one, is a matter too extensive in magnitude for us to understand! but it is a manifest sign of the infinite kill and exquisite art employed by him, who solely of the invented and constructed that beautiful organ of evided lense.

Having described the wonderful structure of the

Having described the wondersul structure of the eye, we shall next consider the admirable provision which is made for its guard and security; it is senced and the with strong compact bones, lodged in a well-made or dark socket, where it is desended from the strokes of any stof; slat body, and guarded with a nice-made cover; the serve eye-lids, which are well sitted for this purpose, are er distance of a thin and slexible but strong skin, by which ages a means they the better wipe, clean, and guard the the two which means they are not only enabled the better to fo firm do their office, but also to close and shut the quickers of the dotter office, but also to close and shut the quickers of this cartilage grows a palisade of stiff bairs, of ctions great use to warn the eye of approaching dangers, and to shut out too excessive light, which would be eature very hurtful: it is remarkable that these hairs grow animal out to a certain length, and need no cutting as many other hairs of the body do; also that their points should tand out of the way, and in the upper lid bend upper might wards, as they do downward in the lower lid, wherey number of the outward coat of the eye ought to be pellucid, to the outward coat of the eye ought to be pellucid, to the counter of the outward coat of the eye ought to be pellucid, to the counter of the counter of the eye ought to be pellucid, to the counter of the counter of the eye ought to be pellucid, to the counter of the counter of the eye ought to be pellucid, to the counter of the eye ought to be pellucid, to the counter of the eye ought to be pellucid, to the counter of the eye ought to be pellucid, to the counter of the eye ought to be pellucid, to the eye ought to be pellucid, to the eye ought to be pellucid, to the eye ought to be pellucid. eye; the edges are fortified with a foft cartilage, by

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transmit the light (which if they always stood open in would be apt to grow dry, shrink, and lose their transparency,) therefore are the eye-lids so contrive as often to wink, fo that they may glaze and varnil them over with the moisture they contain, there being glandules on purpose to separate a humour for tha use, and withal wipe off whatever may flick to them: and this they do with the greatest celerity, lest the should hinder the fight. There are many other curious particulars relative to the eye, but as we have already exceeded the number of pages allotted for this subject, shall conclude with briefly observing that if the eye had been flat instead of being spherical cal, it would not have received the image of any ob ject bigger than itself: for by means of its sphericit or roundish figure, the eye can receive the images of the greatest bodies, and almost a fourth part of the heavenly ones at one glance. O admirable artificer O most kind and gracious God! let the tribute of our grateful hearts ascend to thee.

CHAP. III.

ASTRONOM

BEHOLD and consider the immense extent of the Heavens! let our immagination stretch over millions of miles, and millions more will yet remain undiscovered. Behold the sun begin his course; se the clouds, like floating curtains, are thrown back a his approach; with what refulgent majesty does he walk abroad! how transcendently bright is his countenance, shedding day and inexhaustible light through the universe! Is there a scene, though finished by the most elaborate and costly refinements of human art, comparable to these illustrious solemnities of open

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open funshine? before these, all the studied pageantry of he theatre, the glittering ceconomy of an affembly, or even the heightened ornaments of a royal palace, ride their diminished heads and shrink into nothing. What are all the realms of the world but a dungeon the of darkness, without the beams of the fun? without that grand enlivening principal! what were this earth but a lifeless mass! a rude lump of inactive matter? he trees could never break forth into leaves, nor the have plants fpring up into flowers. When that auspicious d for sovereign of the day unbars the gates of light, and ving lets forth the morn, then what a prospect opens! here the heavens are paved with azure! a variety of the y ob liveliest verdures array the plains! the flowers put on ricit a glow of the richeft colours! the whole creation ges of stands forth, dressed in all the charms of beauty! the haps beheld it a thousand times, and not once conte of fidered what an amazing body it is! a mass of fire, nine hundred thousand times bigger than the earth we tread upon: whose diameter, or breadth, from one fide to the other, measures more than eight hundred thousand miles; its circumference above two millions five hundred and eighty-two thousand miles; its folid contents such as confound the imagination, and are almost beyond the power of numbers to express: this great body revolves round its own axis in about twenty-five days. How great is the Lord that made it with a word! and has continued for fo many ages to supply it in such a manner, and that, notwithstanding the perpetual deluge of light and heat, which it fends forth every moment from all parts, it remains undiminished, and as strong and diffusive as at the first day.

But amazing as the confideration of such a stupendous body is, the heavens shew forth still greater wonders; and as there are various opinions concerning the different systems of the universe, we shall take aman notice of the three principal ones, viz. the Ptolemaic,

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the Copernican, and the New System; each of which in their order.

Of the Ptolemaic.

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In the Ptolemaic System, the earth and waters are supposed to be in the centre of the universe; next to which is the element of air; next above that is the element of fire; next to that the orb of Mercury, then that of Venus, then that of the Sun; and above the Sun's orb, those of Mars, Jupiter, and Saturn; and above them all, the firmament, or orb of the fixed stars; then the crystalline orb; and lastly, the cælum empyreum, or heaven of heavens. All thefe maffy orbs, and vast bodies borne by them, are in this fystem, supposed to move round the terraqueous globe once in twenty-four hours; and befides that, in some other certain periodical times: for effecting of which motions, they were forced to contrive fuch circles as they called eccentrics and epicycles, croffing and interfering with one another.

Of the Copernican System.

The next system is the Pythagorean or Copernican, being invented, as some imagine, by Pythagoras himself. This system (whoever was the inventor of it) Copernicus, a canon of Tourain, restored about the beginning of the fifteenth century, and was followed by many considerable men, Rheticus Kepler, Rotham, and many others. According to this system, the Sun is supposed to be in the centre, and the heavens and earth to revolve round about him, according to their feveral periods: first Mercury in near eighty-eight days, then Venus in somewhat above in two hundred and twenty-four days; then the Earth and with its fatellite the Moon in three hundred and fixtyfive days and one fourth; then Mars in about fix hundred and eighty-seven days; then Jupiter with his hich

four moons in about four thousand three hundred and thirty-three days; and lastly Saturn, in somewhat above ten thousand seven hundred and fifty-nine days, with his five or more moons revolving round him: and beyond or above all thefe is the firmament, or the region of fixt stars, which are all supposed to be at equal distances from their centre the Sun. And fo far as this fystem relates to the motion of the earth. and the Sun resting in the centre, all modern authors

approve of, on these five following accounts.

First, Because it is far more agreeable to nature. which never goes a round-about way, but always acts by the most compendious, easy and simple methods: and in the Copernican way, that is performed by one, or a few easy revolutions, which, in the other way, is made the work of the whole heavens, and of many strange and unnatural orbs: Thus the diurnal cting motion is accounted for by one revolution of the earth, which all the whole heavens are called for, in fuch the other way; so far the periodical motions of the planets, their stations, retrogradations and direct motions, they are all accounted for by one fingle motion round the fun, for which in the Ptolemaic way, they are forced to invent diverse, strange, unnatural, interfering eccentrics and epicycles: an hypothesis fo nican, bungling and monstrous, as gave occasion to a certain agoras king to say, If he had been of God's council when about how to have mended his work.'

s fol. Secondly, As the Copernican system is far more epler, tafy and agreeable to nature than the Ptolemaic ystem, system, so it is far more complete and answerable to the various phænomena of the planets; several of which the Ptolemaic hypothesis either very aukwardn near y solves, or doth not at all come up to. We might
above instance here in divers particulars relating to Venus
Earth and Mercury, as, why the earth is never between
hixtythem and the sun, which the Ptolemaic system gives
no tolerable account of, and but poor accounts of
ith his other of their phænomena; as also those of the Moon

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and the other planets. We might shew also how in coherent and improper the motions affigned to the heavenly bodies are in the Ptolemaic way, as, that the Moon should move round once in a month; the other planets in such and such periods as are assigned to them; the firmament or fixt stars in twenty-five or twenty-fix hundred years; the fphere beyond that in seventeen hundred years; and the tenth sphere in three thousand four hundred years; and the outer most of all, the Primum Mobile, which moves all the rest, in twenty-four hours; which are motions so unproportional and difagreeable, that are sufficient to fubvert the whole hypothesis: but it would be end less to enter into a detail of fuch incoherences and improprieties as the Ptolemaic System abounds with

Thirdly, The prodigious and inconceivable rapide ty affigned by the Ptolemaics to the heavens, is by the Copernican scheme taken off, and a far more easy and tolerable motion substituted in its room; for is it not a far more easy motion for the earth to revolve round its own axis in twenty-four hours, than for 6 great a number of far more maffy and far distant globes, to revolve round the earth in the same space of time? if the maintainers of the Ptolemaic system do object against the motion of the earth, that it to would make us dizzy, and shatter our globe to pieces what a precipitant, how terrible a rapidity must that ti of the heavens be! what a velocity must the sun have w to run its course at the distance of twenty-one, or we twenty-two semi-diameters of the earth! what a very locity must that of the fixt stars, especially that of the Primum Mobile be, at far greater distances that the Sun is!

Fourthly, It is an incontestible argument of the Sun being the centre of the planets about him, and not the earth; that their motions and distance respect the Sun and not the Earth. For with regard to the Sun, the primary planets have a very due motion, it proportion to their feveral distances; that is, their motions round the Sun are in fesquiplicate proportion to their diffances from him: but this proportion dot

the he fecondary planets round Saturn, Jupiter, and the that Earth, it is very certain that they have the fame repect to their primaries, as these primaries have to he Sun; that is, 'the squares of their revolutions are as the cubes of their distances.' And as it is certain and visible, that the secondary planets respect their primaries as their centres, and move round them, so it is in some measure (one would think) no essection, and beyond doubt, that all the primary planets, which have the self-same respect to, and motion, with regard to the sun, as those secondaries have to their primaries; that those primaries do move to their primaries; that those primaries do move sound him as their centre, and not about the earth, with to whom they have no such respect.

Fifthly, The last argument we shall alledge for our preference of the Copernican to the Ptolemaic System, is from the great parity and congruity, observable a-

for is mong all the works of the creation; which have a works manifest harmony and great agreement with one afor so mother.

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Thus in our present case, it is manifest to our ight, that every globe we have any good views of, ighten hat fuch like motions, as those are which we ascribe to the Earth. The Sun indeed being in the centre, is as it were fixt there, and hath no periodical motion; but yet the other motion round its own axis, we can manifestly discern; and as for all the planets which move round about the Sun, they have, as far as it is possible for us to see them, such motions as that of the effect when their own axis, and a periodical revolution round the Sun. And if this be manifest in the other Planets, what should hinder its being so in our of the other Planets, what should hinder its being so in our own, why ours be singular? why not supposed to be respect moved as well as the rest, when it is very certain that to the either it hath those motions, or that the Heavens have son, in such? and it is far more natural and easy for the start to perferm them then the Heavens as both their Earth to perform them, than the Heavens, as hath portion been already made appear.

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Thus having shown how far more probable the Copernican System is than the Ptolemaic, fo far as it relates to the motions of the Heavens and Earth, and the Sun being in the centre; we shall next, agreeable to the observations of the learned, describe the diameter, circumference, and revolutions of fe. veral of the Planetary Bodies, in order as they revolve round the fun, according to their feveral periods, viz.

Mercury's diameter is above two thousand seven hundred and forty-eight miles, his circumference feven thousand seven hundred and twenty-four, surface fixty-two millions, circuit above two hundred and one million, and his distance from the Sun thirty. mu two millions of miles; he revolves round his own good

axis, but in what time is uncertain.

Venus's diameter is above feven thousand miles, circumference more than twenty-four thousand, furface one hundred and ninety-fix millions of square miles, circuit above three hundred and feventy millions, and his diftance from the Sun fifty-nine mil- mi lions of miles; he revolves round his own axis in twenty-three hours.

The Earth's diameter is above feven thousand nine hundred miles, circumference twenty five thousand, furface one hundred and ninety-nine millions, circuit five hundred millions, and distance from the Sun eighty-one millions of miles; revolves round its own axis in twenty-four hours, and flies through the air at the rate of a million and a half of miles each day.

We shall first describe the usefulness of the silver

Queen of Night, next its magnitude, &c.

Let the reader only reflect, that when the last fan beams of departing day tinges the fleecy clouds with glowing purple, with what majesty the moon rifes and adorns the chambers of the east, and throws a filver mantle over the verdant carpet of nature; her reflected rays, at the fame time they delight the eye, and gild every thing with the most delicate shade, yet doth not disturb us with her heat and lustre. Conider how uncomfortable the nights had been, wraped in total darkness, had not a gracious God hung his glorious lamp on high, to enliven the difmal loom, and line with filver the raven-coloured mantle of the night. What are all the decorations of human irt, when compared to those glowing lamps that aforn the ample circuit of the fkies? the most costly efinements ever invented by the wit of man, are nohing in comparison; 'the grandeur of the former is s much above the latter, as thunder is louder than whisper!' Contemplate and reflect on the glorious works of the Creation, fo admirably contrived for the ervice and delight of man, and every noble heart nust be fired with gratitude towards the great and good Creator of the universe. Next of the magniude. &c. of the Moon.

Her diameter is above two thousand seven hundred and sifty miles, circumference six thousand eight hundred, surface one million sour hundred thousand, circuit in breadth sour hundred and eighty thousand miles, which she performs her monthly revolution in, and turns round herself in the same time; she is in distance from the earth about two hundred and

orty thousand miles.

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The diameter of Mars is four thousand eight hundred and seventy-five miles, circumference thirteen housand, surface sixty-two millions, circuit seven hundred and seventy-three millions, and distance from the Sun one hundred and twenty-three millions of miles; he moves round his own axis in twenty-four

nours and forty minutes. .

Jupiter's diameter is one hundred and thirty thouland fix hundred and fifty-three miles, circumference three hundred and ninety-two thousand, circuit in diameter eight hundred and ninety-five millions one hundred and thirty-four thousand, surface of his body twenty thousand millions of square miles, distance from the Sun sour hundred and twenty-four millions of miles: he revolves round his own axis in nine hours and fifty-six minutes. He has sour moons moving round him, to augment his light; the first of the which moves round him in one day eighteen hours and an half; the second in three days thirteen hours and an half; the third in seven days three hours and we forty-five minutes; the fourth in sixteen days sixteen of hours and an half.

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hours and an half.

Saturn's diameter is ninety-three thousand four hundred and fifty-one miles, circumference above two hundred and eighty thousand three hundred and fifty-three miles, diameter of his orbit one thousand fix hundred and forty-one millions five hundred and twenty-fix thousand three hundred and eighty-fix miles, furface fourteen thousand millions, and distance from the Sun seven hundred and seventy-seven millions of miles; he revolves round his own axis, but in what time is uncertain. This orb has five moons attending him, the first of which moves round him in one day twenty-one hours, the second in two days feventeen hours, the third in four days twenty-two hours, the fifth in seventy-nine days seven hours: Now as we know our Moon moves round the Earth in twenty-seven days seven hours, and is of particular fervice to us, in affording us light by reflection during the Sun's absence, so these bodies or moons moving round Jupiter and Saturn in the same constant and round described the sun's absence, so these bodies or moons moving round Jupiter and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and Saturn in the same constant and round supplies and saturn in the same constant and round supplies and saturn in the same constant and round supplies and saturn in the same constant and round supplies and saturn in the same constant and round supplies and saturn in the same constant and round supplies and saturn in the same constant and round supplies and saturn in the same constant and saturn in the same const round Jupiter and Saturn in the same constant and profettled revolution, it seems natural to think they are partintended for just the same purpose as our Moon; and pat that therefore there are inhabitants in those Planets on which fland in need of a constant supply of light as is much as we do.

That bodies though dark of themselves may appear For as bodies of light by reflection is very plain; for in the stance, the Moon has no other light but what it re- conceives from the Sun; and it is the reflection of that he light only, back again, which makes the Moon ap inc pear to us as a body of light. For was the Moon a lin light orb, an Eclipse could never happen; as the the cause of such a phænomena is when this globe of Earth in its circuit round the Sun is coming between

ours cepted from falling on the Moon; consequently she ours must appear a dark body. In the same manner, what and we call an eclipse of the Sun, is in reality, an eclipse teen of the Earth; for it is occasioned by the Moon's teen of the Earth; for it is occasioned by the Moon's coming between the Sun and the Earth; and whenfour ever this happens (the Moon being a dark body) it bove intercepts the rays of the fun from falling on that and part of the earth which it covers, and confequently land larkness overshadows it: though these two bodies and eclipse each other, not so much as their shade approaches any other of the celestial bodies.

There is a particular benefit arises from the diural motion of the Earth; which is that by this means ut in the said globe never lies torpid; if in one spot of it, noons her and animals lie buried in sleep, in other parts him they all live and in action. By the diurnal turning days of the Earth about its axis, every part enjoys the

him they all live and in action. By the diurnal turning days of the Earth about its axis, every part enjoys the hours comfortable light and heat of the Sun, and the grate-individual vicifitudes of day and night; but as to the order ours: of the periods of those planets we have before mentioned, we may add the consideration of the different paths of their periodical and diurnal motions; that uring they lie not in a very different plane as quite across oving or the like; nor exactly in the same, but a little trossing each other; the diurnal course lying in, or parallel to the Equator, but the other in the broad path of the Zodiac, at an inclination of twenty-three lanets one half degrees. What a glorious contrivance this is for the good of our globe, and doubtless no less so for all the rest that sympathize in the like motion!

For was the Earth's periodical motion to be always in or all the rest that sympathize in the like motion!

appear for was the Earth's periodical motion to be always in
the same plane with that of the diurnal, we might
it recommend that be nearer to and sometimes farther from
the Sun; but at the same time miss of those kindly
on appears of day and night, together with such useful
streets of the Sun's beams, which the advances of
the Earth to one or other of the poles cause; which
the obe of the same time miss of those same is the
the Earth to one or other of the poles cause; which
the same same the real causes of our seasons, sum-

tween

mer, winter, fpring and autumn, and not our being in nearer to or farther from the Sun.

We shall conclude this subject with some very short observations on the New or third System, which extends the universe to a far more immense compass than either of the other, even to an indefinite space, and replenishes it with a far grander retinue than

ever was before ascribed unto it.

It is the same with the Copernican, as to the Sur and its Planets; but whereas the Copernican hypothesis supposeth the firmament of the fixt stars to be the bounds of the Universe, and to be placed a equal distances from their centre the Sun, this new fystem supposeth there are many other systems of funs and planets, befides that in which we have our residence, namely, that every fixt star is a sun, and encompassed with a system of planets, both primar and secondary, as well as ours. Mr Derham is a opinion the New System is far the most rational and probable of any, for these reasons; because it is the most magnificent of any, and worthy of an infinite Creator, whose power and wisdom, as they are with out bounds and measure, so may in all probability exert themselves in the creation of many millions a well as one; for here we have the works of the crea tion, not confined to the more scanty limits of the orb, or arch of the fixt stars, or even the larger space of the Primum Mobile, which the ancients fancie were the utmost bounds of the universe, but they an extended to a larger as well as more probable, ever an indefinite space. And as myriads of systems mor particularly demonstrate the attributes of God that one, so it is no less probable than possible, there ma be many befides this which we have the priviledged living in.

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Think not what has been here afferted to be the chimeras of fancy only, for we have advanced not thing but what is built upon the nice calculations of Sir Isaac Newton, and other accurate astronomer

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being and mathematicians, taking the mean difference beween their respective calculations.

CHAP. IV.

ORATORY.

On the Advantage of Public Eloquence.

HOW great must that mind be which can conceive the express image of eloquence! for such a portrait, aptly delineated, must present him with the queen of all things, she rules the mind and sweetly boths the heart.

The greatest geniuses, ancient and modern, have peen profuse in their eulogiums on public eloquence, The fictions of poets have transmitted to us an Orpheus, who, by the sweetness of his musical strains, could draw after him favage beafts, rocks, and other nanimate creatures. By this they would have us understand that it is in the power of elequence to pring to the use of reason, men, even of rocky and parbarous natures; we may justly suppose the foun-ters of cities could not have made an embodied people of a vagabond multitude, without the charms of perfuafive words; nor lawgivers, without the extraordinary talent of speaking oblige men to bend their pecks under the feverity of their laws. We even are conscious to ourselves that the precepts of morality, hough with deep vestiges impressed on our hearts by he author of nature, yet receive an additional beauty and inspire our minds with a more intense love of hem, when illustrated by the ornaments of discourse. Certainly the gracious Creator of our being has difinguished us in no respect more from other animals

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than by the gift of speech; they surpass us in bulk strength, enduring of toils, speed, and stand in less need of foreign helps; guided by nature alone, they sooner learn to walk: but God, as a benisicent parent, has given us for our portions a gift far superior to any faculty the brutes enjoy, viz. the talent of speech; and as the Divine dispenser of all good things has not imparted to mankind a greater blessing, what can we esteem more deserving our labour and improvement? what object is more worthy our ambition?

Before we proceed to mention the advantages different states have reaped by the elequence of their councils, or the great losses they have sustained by being deprived of their orators, it is necessary to give some proper directions for the attaining a complete

knowledge of oratory.

Those whose business leads them to speak in public with a proper degree of elocution, ought to have a fund of good fense, a lively imagination, a faithful memory, an agreeable tone of voice, a correct pronouncation, a noble-gesture, a becoming affurance and a great faculty of speaking; the four last qualities may be acquired by the precepts of art and long exercise; the other are the gifts of nature, which an may polish, but cannot bestow. These talents comprehend abundance of things, yet do not compleat an orator; fledy, and a thorough acquaintance with the learned and polite is necessary. Before a man underdertakes to speak in public, he should cultivate his judgment, by reading the most celebrated authors, and particularly those that have written best in all sciences; he should read the best books of his time, converse with men of the brightest genius, pay serious visits to ladies of wit, and make some small attempts in poetry in order to polish his manners and language.

If any one be so happy as to possess those advantages, he ought in the following manner to apply the precepts which Cicero, Quintilian, and others (of the best masters of eloquence) have delivered.

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When the choice of the subject depends upon the rator, he ought to pitch upon one that is capable of orce and ornament; and firictly to preserve order in he design and connection in his thoughts; if posible, his discourse should never last longer than an nour; the diction ought to be pure, and proper to he subject, rich and adorned without superfluity, trong and close without dryness, suitable to the peron that speaks, to the place, to the time, and to the uditors. He cannot take too much care to avoid intiquated words; the fublime and magnific ftyle dmits of nothing mean and low throughout the whole, not fo much as a fingle fentence; if any fuch thing be observed, it will lose its-character: it conifts in a most exquisite choice of words, polite and elegant, bold and ponderous; great dignity of tropes and figures, which must appear to be used with freetom; be splendid and noble, but not dazzling; soemn majesty of fentences abounding with grand ideas, and choice furniture of periods, numbers, &c. If any thing common occurs, it should be exalted by some trope, or beautified with a figure; thus, inflead of wine, fire, and bread, Bacchus cheers, Vesta warms, and Ceres satiates hunger. Let an orator remember that it is to truth alone he ought to facrifice the production of his wit; he should courageously disengage himself from all interest that may oblige him to be guilty of flattery, and lay fuch a restraint : upon the tongue as shall prevent satire and invective. Great care should be taken to surmount that foolish pride, which hinders many from following good advice; he should guard against the infinuation of felflove, which is natural for us to shew to our own compositions: his narration ought to be exact, clear and concife, to run majestically like a great river and not with the rapidity of a torrent; the elevation of his subject should consist in the greatness of things. treated of, and not in the use of pompous words; nothing must be advanced that will shock probability: but he may be allowed the liberty of digressing from.

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the subject, provided he does not lose fight of it, be tohe returns with more force and agreeableness: his com parisons ought to be just and short; his metaphors a of a piece and natural; quotations few and we chosen; more seldom taken from a foreign than hi native language, unless they cannot be translated wit the fame beauty, or carry more weight and authorit in the tongue wherein they were first written : h ought to avoid all cold frivolous observations, pro verbial or equivocal expressions, points and quibble as fo many ill habitudes contracted from a fordi education, and ornaments unworthy of folid manie eloquence. It is requifite that the passions be moved but then they are to be managed with great discretion and mingled with great variety. In managing the voice great care must be taken, as the accents mus be clear and articulate, every syllable standing of from that which is next to it, fo that they might be numbered as they proceed: the inflections of the voice are to be so distinctly suited to the matter, that the humour or passion might be known by the found of the voice only, where they could not be one work heard; and the variations are to be like the full st fwelling folds of the drapery in a fine picture or fla tute, bold, free, and forcible. True eloquence doc not wait for cool approbation; like irrefiftable beauty reach; the hearer finds himself as unable to resist it as to blow out a conflagration with the breath of his and mouth, or flop the stream of a river with his hand; his passions are no longer his own; the orator has ma taken possession of them, and with superior power, works them to whatever he pleases.

There is no earthly object capable of making fuch th various and forcible impressions upon the human al mind as a confummate Speaker: in viewing the artificial creations which flow from the pencil of a Rasphael, the critical eye is indeed delighted to a high of pitch, and the delight is rational, because it flows from fources unknown to beings below the rational in be phere; but the ear remains unengaged and unentercom rained. It is only the elegant speaker who can at once regale the eye with the view of its most amiable we object, the human form, in all its glory; the ear with with its natural food, the knowledge of important orit ruths; and the imagination, with all that in nature : he and art, is beautiful, sublime, or wondersul: for the proporator's field is the universe, and his subjects all that bles is known of God and his works. In a confummate: ordin speaker, whatever there is of corporeal dignity or peaker, whatever there is of corporeal dignity of hand beauty, the majesty of the human face, the grace of over action, the piercing glance, gentle languish, or siery tion lash of the eye; whatever of fine imagination, of the wife reflection, or irresistable reasoning; whatever mut is excellent in human nature, all that the hand of the it be poblest creature we are acquainted with, all this apwhoever is proof against such a display of all that is noble in human nature, must have neither eye, ear, word passion, imagination, taste, nor understanding. It full is to be remembered, that the action, in expressing that the various humours and passions, is to be suited to does the age, fex, condition and circumstance of the cha-auty, acter. Violent anger or rage is to be expressed with in its great agitation; but the rage of an infirm old man, fift it of a woman, or a youth, are all different from one of his mother, and from that of a man in the flower of his ige, as every speaker's discretion will suggest: a hero may shew fear or sensibility of pain, but not in the ame manner as a girl would express those fensations; grief may be expressed by a person reading a melanfuch tholy story, or description, in a room; it may be aman afted upon the stage, or dwelt upon by the pleader article the bar, and have a place in a sermon, the passion is still grief; but if they have judgment, the manner of expressing it will be different in each of these shows peakers. A correct orator does not make a move-ional ment of limb or seature for which he has not a rea-

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fon; if he addresses Heaven, he looks upwards; if he speaks to his fellow-creatures, he looks round upon thein; the spirit of what he fays, or is said to him. appears in his look; if he expresses amazement, or would excite it, he lifts up his hands and eyes; if he invites to virtue and happiness, he spreads his arms, and his looks are all benevolence; if he threatens the vengeance of heaven against vice, he bends his eyebrows into wrath, and menaces with the arm and countenance :- he does not needlefsly faw the air with his arm, or stab himself with his finger; he does not clap his right-hand upon his breaft, unless he has occasion to speak of himself, or to introduce confcience, or something sentimental; nor does he ftan back, unless he wants to express horror or aversion; he does not come forward but when he has occasion to solicit; he does not raise his voice but to express fomething peculiarly emphatical; he does not lower it, but to contract the raising of it. His eyes; by turns, according to the humour of the matter he has to express, sparkle fury, brighten into joy, glance disdain, melt into grief, frown difgust and hatred, languist love, or glare distraction. There is an error which is too inconfiderately received by many judicious perfons, viz. that a public speaker's shewing himself to be in earnest, will alone secure him of duly affecting his audience; were this true, the enthusiastic rant of the franatic, who is often very much in earnel, ought to please the judicious; on whom, on the contrary, we know it only excites laughter or pity. It is granted that nature is the rule by which we are to speak, and to judge of propriety in speaking; and every orator, who faithfully follows that universal guide, commands attention and approbation: but if he either, through incurable natural deficiency, or by deviating into some incorrigible absurdity of manners express the real and warm sentiments of his heart in fuch an aukward way, as shall effectually defeat his whole defign upon those who hear him; and render himself the object of their ridicule; he may then

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etire from the rostrum, sufficiently convinced of his want of qualifications requisite to constitute an oraor. Though it may be alledged that a great deal f gesture or action at the bar or in the pulpit, espeially the latter, is not wanted, nor is quite in chaafter, it is yet certain that there is no part of the nan that has not its proper attitude: the eyes are not o be rolled along the cieling as if the speaker thought imself in duty bound to take care how the flies chave themselves; nor are they to be constantly cast own upon the ground, as if he was before his judge eceiving fentence of death; nor to be fixed upon ne point as if he faw a ghost. The arms of the reacher are not to be needlessly thrown out, as if he vas drowning in the pulpit, or brandishing, after the nanner of the ancient Pugiles, or boxers, exercifing hemselves by fighting with their own shadows, to repare them for the olympic contests; nor on the ontrary, are they to be pocketed up, his arms to ang by his fides as lank as if they were both witherd. The head is not to stand fixed, as if the speaker ad a perpetual criek in his neck; nor is it to nod at very third word as if he was acting Jupiter. Laftly, judicious speaker is master of such a variety of deent and natural motion, and has such command of ttitude, that he will not be long enough in one posure to offend the eye of the spectator.

We shall conclude this subject with briefly remarkng the many advantages community have enjoyed,

y having men of elocution in the fenates.

Should we pass in review the histories of remote ges, it will appear that the splendor and welfare of a fact states and commonwealths were chiefly owing to be force of eloquent counsels. Athens, the pridef Greece, the great nursery of arts and sciences, ever decayed in power, never lost its liberty, till eprived of its orators. Nothing was so advantage us to the Roman republic or heightened so much its lory, as the encouragement given to oratorical talents, and the laudable exercise of the same noble faculties:

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hence so many speeches and harrangues in the affemblies of the people, and in the senate; which were esticacious to obtain what could not be extorted by the injunctions of public edicts. In like manner, generals of armies, as often as they were to give battle, as often as sedition and mutiny alienated the soldiery; so they were wont by powerful eloquence, either to invigorate their hearts with manly courage,

or recal them to a fense of their duty.

The true cause of the great credit of the civilians under the Roman emperors, may not improperly be attributed to the abject flavery they infenfibly led the fubject into; while Rome preserved her liberty, no great account was made of the civilians, the orators held the first rank in the city, as well as at Athens; and this is the reason why the Greek and Roman eloquence was fo highly esteemed and applauded. Augustus, an able politician, perceived the danger he was in from the orators; he well knew, that whoever has a genius for a noble eloquence is bold, active, and a great enemy to flavery: in order therefore to bring down the orators, he fet the civilians against them, and ordered the judges to submit to their decisions; who till then had no further authority than the possibility of persuading the judges. It is plain that when Augustus raised the civilians, he depended upon their compliance, wherein he was not mistaken; for they explained the laws in his favour, and made it their business to justify his unjust though mild usurpation. They found a way to reunite in his person the most important dignities; and when they had by degrees accustomed the Romans to make application to him alone, and had rendered him mafter of a people who had conquered the world; they made him master of the laws, by virtue of this famous maxim which they took care to inculcate, That what pleases the prince stands for a law. By this means they ascribed an absolute royal power to Augustus. The following emperors imitated that prince; Vefpasian raised the civilians to the highest degree of auall

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thority, and compleated the destruction of liberty and eloquence: from the time of Augustus, his successors got fuch an afcendancy over the people, that the mysteries of the cabinet were studied, which contained that absurd doctrine, of the interest of the prince; as it is separate from the interest of the state, and generally runs counter to the public good, judgment, capacity, and fecrecy, were changed into craft, artifice, and diffimulation. Good and ill actions were no longer known by themselves; every thing was interpreted according to the nice intention of the prince, or was judged by the curiousness of some malicious speculation, Complaints, which in all ages of the world have been allowed to the unfortunate; tears, those natural expressions of our grief, and fighs, which flip from us in spite of our will; nay, bare looks at last become fatal. The least endeavour to use the persuasive force of elequence was thought the highest pitch of arrogance; even the simplicity of discourse was fancied to cover ill designs, and the discretion of silence to conceal mischievous intentions. To speak, to be filent, to rejoice, to be afflicted, to be fearful, or undaunted; all was criminal, and very often incurred the most rigorous punishment. Thus it was this noble people, from tasting the sweets of the best regulated liberty, which had its sources in, and was nurtured by nervous eloquence, fell into the fnares of the worst of tyranny and oppression; and fuch likewise are the calamities that must wait all other nations, when they prize more the finister arts of life, than the beauty of order and integrity; the natural refult of free and uncontrouled eloquent counfels.

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CHAP. V.

MORALITY.

MORALITY is of fo large an extent, and the practice of it admits of fo many degrees of perfection, that we cannot at once acquire a due conformity to all its various prescriptions. The attainments of virtue must be gradual, must be the result of repeated thought, and of repeated efforts. It must therefore be of great importance to fet out in the moral course, upon such principles as will give the amplest scope for perpetual improvement, and be most favourable to our progress in every real excellence. Virtue confists in good affections; this be a must undoubtedly be understood not of transient or temporary emotions, but of fuch dispositions as are that habitually prevalent in the foul. A fingle act of virtue, or the most casual exercise of any good action, to be though it be not attended with Readiness and con- our stancy, claims the approbation of every spectator, more but to denominate us truely virtuous, it is necessary ally that our inclination to whatever is right and good able should be fixed and permanent, and that it should uniformly influence every part of our conduct. It is however evident, that though we cannot imme some diately arrive at any considerable degree of persecution in the practice of morality, yet the first heart their and deliberate resolution that we form, to endeavour on the discover it, gives us a title to the virtuous character afford as the forming such a general resolution is all that person possibly can be done at once. If this resolution has f possibly can be done at once. not taken place in our minds, occasional acts of duty years ever so often repeated, will be of little moment in situal moral estimate; and after we have once solemning ever, formed this purpose, nothing but our wilful negled ng co he

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to put it in practice, can prevent us from making continual advances in every species of virtue and roodness: our first ftep then must be to confider. whether or no it is expedient that we should resolve invariably to submit to all the laws of morality? Let is now therefore take a view of some of those arguments which must be sufficient to lead us to such a resolution, if we will but attend to them with any degree of seriousness: and here let us suppose some person who has hitherto had no regard to the duties of life, nor perhaps ever admitted any kind of ferifult ous thought, suppose such a person, by some means it or other, awakened to a sense of the propriety of in enquiring into the natural tendency of his own acex time; the result of his enquiries, must undoubtedly existing; the refult of his enquiries, must undoubtedly this be a full determination to endeavour to become as virtuous as possible; such a person must be sensible, are that as yet he has lived to but little purpose. It is commonly afferted, that there is no real happiness ion, to be derived from any source, but the practice of our duty. Many of the advocates for religion and tor; morality affert farther, that all, who are not habitually virtuous, must be inwardly wretched and misercook able; but we will not go so far at present. There is outly independent of the same and outledly much truth in these affertions; but these, as well as all other positions, may admit of some exceptions; we will therefore allow it possible, free that some of those, who are wholly unmindful of their duty, may scarce ever feel themselves unhappy on that account. There are so many different ways a car so suppressing serious thought, and our present state affords such a variety of animal gratifications, that a that berson who enjoys a large flow of spirits, especially a har possessed in ward uneasinesses, which are the sual consequences of neglecting our duty; this, howemal ver, depends upon a prodigious number of concurred and circumstances; it is every moment possible that

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fome unexpected event may take place, which will force him to view things in a very different light from any in which they have ever before appeared to him. Bodily pain, the disappointment of some favourite scheme, a thousand incidents too minute h be thought of, or too fudden to be guarded against may render all his former pleasures infipid, and plunge him into endless diffatisfaction and reftleffness It is certain, that all who are guilty of grofs and fla grant vices, must be habitually subject to miserable anxieties, felf-difgust, and heart-felt distress. The who are only guilty of neglecting their duty, can no ver be secure of any real satisfaction; as soon; ever they take a just review of their conduct, and form an impartial estimate of their real state, the must perceive that they have acted an unworthy par in life; and that at present they are not capable of any thing that deferves the name of happiness; and let the course of their lives be ever so prosperous, le them have enjoyed every fatisfaction which it is pol fible for them to enjoy without virtue, when the hour of death approaches, if they are capable of a flection, they must feel, and own, that all their pur fuits have been vanity, that they ought to have & cured some nobler enjoyments; and that a life to l fpent over again in the same infignificant and triffin manner, would be an object unworthy of a fing wish. If these will be our sentiments at the conclu fion of life, it cannot furely be impertinent to incu cate them upon those, who may apprehend such period at the greatest distance. The earliest part life cannot be too early to anticipate the ideas an fentiments which we shall form at its close; who we shall certainly fee things in a much juster light than we do at present: can we be wife too soon what a pity is it, that we should spend but half all in fuch a manner as will yield us no fatisfaction death! what a folly to spend any part of our time fuch a course as will heighten our distress at the tr ing hour!

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If the person we now suppose to be deliberating bout his future conduct, has launched out into any of the more enormous vices, he must already have felt n some measure the sad and deplorable consequences of immorality; for there is in fact, scarce any vice hat does not involve those, who practise it in some considerable inconveniences: if he has only been rerardless of the duties he ought to have performed, he nust at least be sensible that he has never yet enjoyed my satisfaction equal to what his mind prompts him o defire, and hope for; it must therefore be worth his while to try whether or not he cannot attain those sperior satisfactions, by entering upon a virtuous, fourfe. It cannot furely be out of his power, some way or other, to attain to the gratifications of his highest defires; and what method can he now try, out that of virtue? Whether our enquirer chooses to be determined by the general experience of mankind, by the natural consequences of human actions, eiher of these ways of judging must equally lead him o forfake his vices, and to refolve upon virtue. The iniversal experience of mankind bears witness to this reat truth, That the virtuous alone are possessed of he great art of enjoying life; and reason tells us, hat every vice must necessarily hurt us, either in our ortune, health, reputation or the peace of our ninds.

Should this enquirer farther proceed to take a iew of every particular virtue and vice, he would eed no argument to convince him, that every kind f virtue is infinitely amiable, and highly advantageus, and every vice worthy of his abhorrence, and ecessary to be avoided, if he has any regard to his wn welfare: but we suppose him now only endeaouring to form some general standard for the regution of his future conduct; and this view must deermine him to submit to all the laws of morality ithout exception. That different kinds of conduct aust be attended with different consequences, is an adisputable truth. That it is possible for us to do

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fomething that may tend to fecure and heighten the comfort of our lives, is likewife a point not to be doubted: It is indeed no less than madness to hope for complete happiness in such a state as this. best and wifest of men have their uneafiness here, but if the votaries of wisdom are too often unhappy, how much less can the flaves of folly ever enjoy and real felicity! Two things are evidently necessary to our passing through life with any degree of fatisfac. tion; our passions and defires must all of them be subject to the dictates of reason, and regulated in fuch a manner as not to clash with one another; and our conduct must be steady and uniform. If we have various passions and desires, we must always be in state of war and commotion; if we have only one predominant paffion it will grow infatiable, and render happiness unattainable. If our conduct be not fleady and confistent, we shall defeat our own views in life, and can never approve ourselves; and with out self-approbation any real fatisfaction is a men chimera. Let it also be remembered, that an inflexible Readiness, in any kind of vice, only renders a character the more detestable and the more pernici ous; it must therefore be only a virtuous steadines that can be the proper object of our pursuit : this a lone can fit us for every ftate of life; this will fupport us under every possible affliction! But if we have indulged ourfelves in vice, how will the recollection of our follies augment and aggravate even harg f th trouble in which we may be involved! Whatever is conducive to our happiness, upon the whole, mult s fa certainly be a part of our duty: nor do the laws of wher morality require any thing but what actually contriicio butes to our welfare, and who therefore can be fo y co absurd as to neglect them? If we wish to recommend ourselves to our fellow-creatures, in what war er t eal a can we do it so effectually, as by a steady and faith ful discharge of every part of our duty? But our ve re chief happiness certainly consists in the inward seel nora ings of our own minds; and this confideration multiuend

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be absolutely decisive in favour of virtue. principle of conscience, which is implanted in every ruman breaft, is capable of rendering the vicious miserable by its reproaches in the most prosperous fate that we possibly can be with respect to worldly ffairs; it can also render the virtuous happy by its approbation of their conduct, amidft the severest triis and afflictions. If therefore the virtuous only can njoy the applause of their own consciences, this instimable satisfaction must be a sufficient compensaion for all the worldly inconveniences we can ever draw upon ourselves by the practice of our duty.

But farther still, though the person we suppose to be engaged in this moral enquiry, should not have peen used to restect upon the existence and perfections of a God, it is however to be prefumed, that at this eason of calm reflection, he will be capable of difterning the evidences which nature and reason afford of an eternal, invisible, and all-perfect Being, whose ower was the first cause of all things, and by whose providence the whole world is continually governed. Hence must arise a new set of motives for the choice of virtue: for if there is really fuch a Being at the lead of the universe, it is apparent that he must have a peculiar regard for the virtuous; and that he will order all things in such a manner, as shall be not for their advantage. The light of nature entourages us to trust, that if we endeavour to difwere charge the whole of our duty, we shall not want any ever of those temporal blessings which may be upon the whole expedient for us: nay, the light of nature leads as farther to expect some future state of existence, way confirms these suggestions of nature; and thus under the moral government of God, there is not one call advantage, which we may not justly hope for, if we regulate our conduct agreeably to the laws of norality; while on the other hand, such fatal confequent was are annexed to the indulgence of vicious different.

positions, as ought to make us tremble, so long as we continue unreformed.

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We infift principally upon those arguments, which prove virtue to be our interest, because these are the arguments which have the strongest and the most universal influence upon the human mind; but at the same time, that any person is calmly enquiring what course of action must be most conducive to his interest upon the whole, all his natural sentiments of morality must undoubtedly concur to six his choice a right. Our reason must on every occasion resent the indignity of being reduced to a state of subjection to irregular and disorderly passions. Our reason must give its sanction to every particular species of virtue. Nor shall we in this deliberate enquiry be able to reject the arguments in support of our duty, without seeling that we commit an act of violence against the

best and noblest part of our nature.

All these considerations being fairly put together virtue appearing to be productive not only of inward peace, tranquillity, and joy, but likewife of all those external bleffings which are really expedient for us fatisfying all the reasonable defires of our nature raising us to the highest dignity of character here and preparing us for still more exalted perfection and blifs in a future state; and vice being in every rel pect the direct reverse, what can be the result of the whole, but that every one, who is defirous of make ing a right choice, must resolve to discard every prin ciple, and every purfait that is inconfistent with vir tue, to omit no opportunity of performing any actor duty, to improve every hour to the most valuable purposes, and to use his best diligence to attain ever possible degree of moral rectitude and goodness? A foon as we are convinced that this is a rational fyl tem, we should admit of no delays: we ought in mediately to impress it upon our minds; and in form ing this resolution, we should use every circumstance of folemnity that may increase our sense of its im portance, and perpetuate its influence upon our fu

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ture conduct. From hence we are to date our commencement in the glorious course of virtue and goodness; and after we have once entered into fuch an engagement with ourselves, we must often recal it to our thoughts; in fact we must never fuffer any thing to exclude it from our minds, for if it were not neceffary for us always to retain this resolution, it could not be possible for us to form such a resolution at all.

When we first enter upon the virtuous course, we find the performance of some part of our duty may be attended with some difficulties, and we may sometimes be inclined to imagine, that we might obtain fome advantages by actions that are contrary to our duty; but after we have decided the grand point, that virtue is, upon the whole, conducive to our chief and highest interest, we should not permit any prospects of temporary pleasure or advantage to retard the profecution of our virtuous purposes; and we must always remember, that by perseverance, the most difficult duties will become easy; for it is not the difficulty of performing any part thereof, that fo unhappily enfeebles our efforts towards the attaining of the more sublime and exalted degrees of virtue and goodness; it is our own irresolution that unmans. that fetters, and betrays us: it is the weakness of our attachments to whatever is good, that puts it in the power of any temptations to triumph over us, or in any degree to obstruct our progress towards persection. No duty can be disficult, when we are once fully determined to perform it; as foon as the resolution is completely made, the execution of it must be easy, and not only so, but delightful; and who can fully conceive what glorious attainments we might make in every thing that is truly excellent, were our resolutions habitually strong enough to preferve us in the uniform and steady pursuit of moral form perfection? Let us then be honest to ourselves, and tance unless we can fully confute the arguments in favour of virtue, let nothing prevent our strict adherence to r fu that noble principle of conscience.

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The great point being once determined, that we will steadily and uniformly persevere in such a course of action as we shall find to be most fit and reasonable, and conducive to the best and most important purposes; we must proceed, as soon as possible, to such further enquiries as may enable us to form a just stan. dard of conduct for every part of life. In this fearch, our first attention must be due to the constitution of our own nature: Virtue has justly been defined as confisting in a conformity of temper and conduct to the general nature and fitness of things; but though there must undoubtedly be some general rule of conduct fuitable to every different species of rational beings, yet with respect to each particular species, the fitness or unfitness of any action must have a more special reference to their particular nature and constitution. Whatever is, upon the whole, agreeable to the frame of our nature, must upon that account be incumbent upon us, though there may be other and more general confiderations to enforce the same duty. We cannot doubt that every particular species of rational beings is well constituted by God: we are certain at least, that we are well adapted to the purpofes of rectitude and virtue. It is evident, that what. ever is contrary to the dictates of our nature, must be equally repugnant to every kind of real excellence and perfection; and it is impossible that any being should be happy, in any way that is not perfectly agreeable to the original bent and tendency of his nature. Our moral enquirer must therefore find it well worth his while to examine himfelf as minutely as possible; and in this enquiry let us now attend him.

The first particular that will engage his notice is, that man is a being capable of many kinds of pleafure and pain, the prevalence of which must make him either happy or miserable: from hence it follows, that that course of action must be his duty, which will procure him the most numerous and the greatest pleasures, and guard him most effectually from un-

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But man is so constituted, that his happiness is very often as much affected by his expectations, with respect to what is to come, as by any thing that he actually enjoys or suffers at present. Our present portion, whether good or evil, foon becomes familiar to us; nor is there any one circumstance in life, which can long occupy our attention, fo far as to prevent us from feeking after something farther. We cannot help desiring whatever we imagine will prove an advantage to us; and we are anxious to avoid any thing that threatens us with pain and trouble. To this purpose, various passions are deeply implanted in our nature, exciting us vigorously to pursue such objects as will be conducive to our welfare and pleafure, and to fly from every thing that would hurt or diffress us; and with respect to those things which are not the object of any natural passion, we soon conceive an inclination or aversion to them, according to the light in which we view them, as advantageous, or the contrary. It is evidently our duty to gratify such of our passions, as shall be consident with our happiness upon the whole; and as to those things. to which we have no original and conflitutional inclination or aversion, we ought to inform ourselves thoroughly whether they tend to promote our eternal welfare, or to occasion us pain, and then to pursue or avoid them in fuch a manner, as is fuitable to our natural defire of obtaining every possible good, and Our escaping every real evil.

his We shall not particularly take notice of the several

passions which relate only to the concerns of animal life: we shall only observe in general, that as virtue is, implies a due regularity and mutual subordination of lea- all our inclinations and desires, it must necessarily be ake the most certain method of procuring the completest ws, gratification of each of them, as far as is really expected; but those desires of the human mind, which test spring from or are naturally connected with its moral unfeelings, must undoubtedly deserve a very considerable degree of attention.

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There is however a principle far superior in our frame, the faculty of reason: by this faculty, which is evidently the chief glory of our nature, we are closely allied to the most exalted rank of beings, even to those who are entirely free from the influence of By this faculty, we are enabled to form fome judgment upon every object, and upon every idea that can prefent itself to our minds; and the decisions of reason are invariably just, as far as it is acquainted with the feveral circumstances of the cases to be determined: our reason, if rightly exercised, will enable us to trace out the various confequences of actions, to difcern the propriety or impropriety of any kind of temper and behaviour, and to form ourfelves a regular and confistent system of conduct for every possible occurrence of life; nothing therefore can be more evident, than that this principle ought continually to govern within us. It is only at particular feafons that our passions can justly be indulged; but it must always be expedient and necessary to submit to the commands of reason. It is reason alone that can justly determine when, and in what degree any of our passions ought to be indulged. It is reason alone that can prevent our passions from becoming excessive, and secure us from contracting dangerous inclinations towards unfuitable objects. The right use of our reason will render every emotion of hope or fear, of joy or forrow, and of defire and difgust, advantageous to us upon the whole: but if reason does not predominate within us, the practice of virtue, or the enjoyment of happiness must be wholly out of our power.

The importance of virtue, and the fatal confequences of vice, would be apparent from the deductions of reason; but to excite us the more powerfully to the discharge of our duty, our constitution is surnished with strong propensities to goodness, till it is corrupted by evil examples and the indulgence of victious habits. An affection to every thing that is agreeable to reason, may justly be supposed natural to

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every rational mind; but as the deductions of reason are in some cases extremely slow, and the mind of man liable to be misled by false views of things, we have the additional principles of moral fense and of conscience, and an ardent desire of attaining the completest degrees of every kind of real excellence. These principles lead us to the perception of some duties which reason alone might not so easily have discovered, and afford us new motives to the practice of every thing which reason prescribes. The moral sense convinces us of the beauty of virtue, and engages us to the love and practice of it, as being in its own nature supremely amiable; conscience, with peculiar energy, applies the general truths of morality to every case in which we are more immediately concerned, urges us inceffantly to perform whatever we perceive to be right and fit, makes us happy by its applause whenever we have acted well, and condemns us immediately when we neglect our duty.

Our natural affection to every thing that is truly great and excellent, must prove a strong incentive to the acquisition of every kind of virtuous perfection. It is true indeed, that this principle sometimes takes a false turn, and degenerates into a wild ambition, a defire of being diftinguished by fuch attainments as are either of no confiderable importance, or of an evil and pernicious nature : but true greatness, and true goodness, are in reality, inseparable; and though the human mind naturally afpires to every thing which can be considered as a mark of distinction, the excellencies of virtue must undoubtedly appear to every one, who reflects at all, superior to every other excellence or distinction that can possibly be conceived; even the most vicious must at times be sensible that virtuous attainments are the highest and most listinguishing honours of which our nature is capit is ble; we must therefore not only bid desiance, but we must also eradicate from our minds the moral insertion in the conscience, and every just and natural prinal to al to

ciple of ambition, before we can be in any degree comfortable and easy in the neglect of our duty.

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There is likewise in the human mind a natural love of truth, and a strong defire of increasing in knowledge: we cannot but wish to be acquainted with truths of every kind; but the discoveries of those which more immediately relate to our moral conduct afford us peculiar fatisfaction and delight: and as the faculty of reason amply qualifies us for the investigation of truth, our thirst for knowledge must in general tend to incline us to our duty. An enlightened mind cannot fail to discern the excellency and importance of morality; and nothing but absolute ignorance and stupidity, or a wilful inattention to truth, can render us indifferent to the glorious pursuits and

attainments of genuine virtue.

It is evident that man is a being of an active nature; that his powers of action are many and various, of en and that he never can be happy in a state of indo for i lence. Each of our active powers, whether bodily lest or mental, frequently stands in need of relaxation; he p or mental, frequently stands in need of relaxation; he plut when we cease to exert any one power, we need cope cessarily recur to the exercise of some other power or nterestaculty, as the only way in which we can have any use real enjoyment. There are sew persons who can urn long support a vacation from bodily exercise; but stive life becomes an intolerable burden, when we simplified becomes an intolerable burden, when we simplified becomes an intolerable burden, when we simplified becomes an intolerable of bodily labour, and of recommental application. Some indeed seem to have some out an art of trissing, by which they pass through life without any serious application, without any real leave business, and yet at the same time persectly free from the case is, that such persons either apply themselves to be mere trisses with all that earnestness, which is due to the most important concerns, or else their appearance of ease is wholly counterseit. There is not a greate id, to contradiction in nature, than to suppose a man can be then shappy whilst he has no object that he judges worth they of his attention; and if his attention be engaged, is circularly the strength of his attention; and if his attention be engaged, is circularly than the suppose a man can be they of his attention; and if his attention be engaged, is circularly than the suppose a man can be then supply whilst he has no object that he judges worth they of his attention; and if his attention be engaged, is circularly than the suppose and the suppose at the suppose and the suppos ve

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e will doubtless excite his active powers. To be indiferent towards all kinds of objects, is indeed the fault out of few: most persons are much rather chargeable with the opposite extreme, of being too keen in their lefires, and too eager in their pursuits, though the bjects they have in view be of ever so little imporance. Hence we fee to much agitation and buftle mong those, who have scarce ever formed one serious and rational purpose in life; whereas half the pplication and pains they beftow upon the most inignificant trifles, would be fufficient, if rightly diected, to conduct them to the highest happiness they fould possibly attain. But though an habitual appliation to our duty would preserve as from much unecessary labour and fatigue about trifles, it must owever require conftant attention and unwearied natiligence, and will afford us numerous opportunities out of exerting all our powers to the greatest advantage; or is it possible we should exercise the best and nodily lest powers of our nature to real advantage but by dily dest powers of our nature to real advantage but by one he practice of virtue. Virtue alone can give full cope to our activity; and that which is our highest of the needs ought to be prosecuted with the most vigoral us efforts. If we would wish to make the activity of can ur nature advantageous to us, if we would not be dive and laborious altogether in vain, we must be ontinually labouring to attain to every possible dente of virtuous perfection. But man is a free as well out an active being, and this is one principal source of the life ur happiness; our will cannot be compelled; we are real lways capable of exerting ourselves in whatever way from anion of rational powers: for to what purpose could est to be endowed with a capacity for deliberation, if the were not at liberty to chuse or resuse, in every rance see, as our will shall determine? It has indeed been reate lid, that man is governed by his own opinions and an bentiments; and that they must necessarily be such orth they actually are, being formed by a concurrence ed, it circumstances entirely dependent on his own will and choice. But though the opinions we have enter tained must necessarily influence the state of ou minds, fo long as they continue predominant within us, it is certainly at all times in our power to call in reason to our aid, to examine them calmly and impartially, and to correct our fentiments, and reduce them to the standard of propriety. We may by this means convince ourselves, that what we once imagi ned to be our greatest infelicity, may in reality be most conducive to our welfare; and thus we may render ourselves happy in circumstances of the great est difficulty. There is in fact, nothing so much un der our power as our own opinions, and all other things, but our own opinions and conduct, are able lutely exempt from our power; but whilft we have these at command, we must certainly be free in the most important sense; and we cannot give a mon convincing proof of our freedom, than in the choice of virtue, amidst the various difficulties to which it often exposed; difficulties of such a nature, the though we may reasonably trust they will determine heart to our advantage, yet nothing but an absolute free dom of choice could enable us to encounter then with resolution and chearfulness. It is evident that every vicious principle tends to destroy our freedom it limits and confines our choice, and infinuates, the every thing which is inconfistent with its own grat fications to be unworthy our regard; but the virtuo principle is ever ready to submit to the closest ex mination; if then we would preferve our liberty, w must be virtuous.

Another leading principle in the frame of man, his attachment to his fellow-creatures. Exclusive those connections which he enters into by the volumn just tary combination of public focieties, he feels that hof eve cannot be happy without a generous regard to the lue us welfare. This natural feeling is manifestly conductance cive to our improvement in virtue, a principal parti will now which consists in endeavouring to be useful to all a our feeling in the consists of the consists round us; and if we are desirous to contribute alli ue, a

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our power to the happiness of mankind, we must culivate every virtuous disposition; for if we are deficient in any one of the several branches of virtue, it will in some degree lessen our abilities to serve those whom we would wish to affist and befriend. It is not necessary to our present purpose to enumerate the sereral ways in which our focial affections must operate: et us only remember, that our natural relation to one mother, should lead us to consult the welfare of all men, in every possible variety of circumstances, but especially of those who are most worthy; and every action that proceeds from this principle, will afford us fuch exquisite pleasures, as will render it its own reward.

But as true piety must imply an ardent regard for our fellow-creatures, for, as a venerable writer justly argues, ' if we do not love our brother whom we bave feen, how can we love God whom we have not feen?' in like manner genuine charity and benevolence towards mankind must imply purity of nine heart, or a rational moderation in all those defires and pursuits which relate immediately to our personal in-terests or pleasures; for if our attention is wholly en-that prossed by our own concerns, we shall often be led into such a course of actions as must be absolutely in-that consistent with every principle of benevolence toward others. Charity must always be productive of piety; orif we are truly studious of the welfare of our fellow-experiences, how can we fail to imbibe the warmest af-ections toward that Being, who is in his own nature he worthiest object of our love, as well as the origin, hal source of all the happiness that can ever take place ve on the universe? if we consider virtue, as consisting olus n justice, this must naturally lead us to the discharge at he of every part of our duty, as being a debt of justice the lue unto God; and it is also evident, that there is not carce any one act of morality, the neglect of which will not some way or other prove injurious to some of all our fellow-creatures. Or again, if we consider viralli ue, according to the primary import of the word, as confisting in fortitude and strength of mind, what principles can be sufficient to enable us to acquire a steady fortitude in many circumstances of human life exclusive of an humble submission to the will of God and a disinterested attachment to the welfare of mankind.

Many cases will occur in which no general rule can be sufficient to guide as; there are some cases fo intricate and perplext, that after the utmost deliberation, we may be at a loss how to act: but if we should determine precipitately we may have endless cause to repent of our rashness; therefore, serious confideration must be absolutely necessary; for if we admit a diffipation of thought, one unguarded moment will plunge us into fuch extreme irregularities of conduct, for which no future care or diligence can be able to atone. The continual changes of our circumstances in life must require new surveys and new refolutions, and the best principles may lead us into the most dangerous excesses, if we do not recolled ourselves, and confider to what degree they ought to be purfued, and in what inflances they ought to be preferred to those of a very different kind. Piety may foon degenerate into foolish superstition, or wild enthuliasm; generolity may betray us into many weakneffes; the love of justice may render us savage and intractible; and fortitude may end in heroic mad-

It is possible that our social feelings may become too strong, and expose us to many inconveniencies; and for this reason, the love of independency is strongly imprinted upon our minds: every scheme of virtue that consists in retirement and a state of separation from mankind, is absurd and inconsistent; and every attempt to secure our happiness, by the neglect of those good offices which our fellow-creatures justly claim from us, must render us incapable of any solid satisfaction and self-enjoyment; but whilst we are doing all in our power to promote the welfare of those around us, we must beware of any

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ceive and unworthy compliances with their capricious humours. Our nature forbids us to give way to immediate uneasiness, if, in some cases our endeavours fail of producing all the good we could wish : or, if in others all our acts of kindness and friendship cannot procure us the approbation and esteem of those whom we have laboured to please and serve. Our nature teaches us to be as useful as possible to others; but at the same time to live to ourselves; that is, to guard against every connection that might obstruct our progress in virtue, diminish our inward peace and comfort, or defeat any of the great purpoles for which we were brought into being; and if in any case, mankind appear to be generally wrong, we must refolve to adhere to our duty, in opposition to every means they can use to diffuade or deter us from what

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But though we may justly glory in our being thus independent upon man, we ought always to remember that we are in every possible sense dependent upon God; we have no one source of happiness but what we originally derive from him; to him we are indebted for all the powers of our nature; to his perfeyering providence, we owe the continuance of all our capacities and faculties; and his concurrence s necessary to the success of our best concerted chemes, and most vigorous efforts, for the attainment of happiness: in ourselves we are weak and indigent creatures, our wants are many; and he only can supply them; our frailties and impersections are nnumerable; and he only can enable us to attain to any thing that is truly valuable, great and excellent. If his favour and blefling are thus effential to our well being, we ought certainly to cultivate a most numble sense of our constant dependence upon him; and if the disposal of every thing relative to us is entirely in his hands; if all that we are and all that we have, are derived from him; if we have already received the most ample communications of his bounty, and are encouraged to hope for still further instances

F 3

of his goodness, it must be incumbent upon us to endeavour to please him thro' the whole course of our lives; it must be our duty to study his will,, and to fubmit ourselves to him in all things : the perfection of his nature, and the manifest obligations he has conferred upon us, give him a right to our obedience: we must therefore be accountable to him for even part of our conduct; and of this he has given us full ficient intimations in the original structure of our minds; for it is apparent that all the various nations and tribes of mankind, of whom we have any know. ledge, have a natural fense of God imprinted upon them; not only as their Almighty friend and protect tor, but also as their great Sovereign and Judge. And if he is our judge, it is evident that we cannot fecun his approbation by any method, but by the practice

of virtue, righteoufness, and piety.

Let us just take notice of another particular in the human constitution, which, though little attended to by fome, is however capable of affecting our hap piness to a great degree. Man is naturally fond of ent. variety and novelty; and what is there that can af ford us such diversified pleasures as virtue can? the pursuits of vice are very nearly the same during the whole course of the longest life; and the pleasures of appetite can only be the same transient sensation tion repeated from time to time, and on every repetition designated capable of affording us any considerable delight; exer but virtue expands the mind, enlarges all the power of our nature, opens within us new avenues of joy, in fi and, by increasing the extent of our activity, and adding a dignity to our characters, purposes and views it leads us to such kinds and degrees of satisfaction and joy, as our imagination could not previously have conceived: and here it is also to be remarked, that in consequence of our love of variety, and the change commableness of our taste, we may soon be disgusted with even any of the pleasures of vice; but if we continue virtue. tuous, our relish for each of the joys that result from true goodness, must perpetually increase,

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If man is fond of variety and change in his pleafures, he is necessarily subject to a vast variety of alterations and changes in his circumstances in life. When we are most at ease, we are every hour liable to the most sudden transitions from joy to forrow, from health to fickness, and from affluence to want a and when we are under the pressure of affliction, a change for the better may instantly take place: this conflant uncertainty and changeableness of our circumstances in life, is undoubtedly advantageous to us upon the whole; but to support these changes aright, it is necessary that good principles should be firmly established in our minds. Virtue alone can prepare And us for every change, and enable us to preferve a un noble fleadiness and serenity amidst all the vicissitudes of life.

Of all the changes to which we are subject, that the which closes our present scene of existence must de-ded mand our chief attention. Whatever our present condition may be, it will foon become totally different. Man is a fhort liv'd being, and cannot be certain of any more than the present moment: this is a solemn perpetual call to the most active diligence the and zeal for the improvement of our time, for the area acquisition of every virtuous excellence and perfecdesigns as speedily as possible; and if we habitually exert ourselves to this purpose, we shall not have lived in vain, though our term of life be ever so short. In such a course we must have attained the best and most valuable enjoyments that this state can yield us; and the conscientiousness of having acted an useful and honourable part in life, must enable us to meet that the with fortitude and composure at least if not have death with fortitude and composure at least, if not that with rapture and triumph: but how incapable of nge comfort must the vicious man be at the hour of death, with even though he should have been uninterruptedly from So long as we are continued in this state, we must

be capable of a constant progress in every thing that

is truly good and excellent; no attainments we man have already made, can put it out of our power to make a still further progress; our actual attainments must in fact enable us, and lay us under an obligation to be continually pressing on nearer and nearer to perfection: were we to live ever fo many ages, we might fill be improving in wisdom and goodness; but though the utmost attainments man can make in this life, are attended with fuch defects, as ought to keep him perpetually humble, yet he that does the best in his power, must necessarily make some considerable advances in true goodness, and confequently must be the object of God's approbation, and entitled to high esteem among mankind. But our consummation in perfection and blifs can only take place in a future state: our natural feelings lead us to exped fome future existence : and, Divine revelation assures us, that this life is only a state of probation, to fit us for a glorious immortality, where virtue will be crowned with unfading glory and felicity, and vice be overwhelmed with remediless confusion.

Here then let us make a folemn pause, and let every one give full scope to the suggestions of his own heart, upon such a subject as the expectations of a bleffed immortality; -the nature of man and the great purposes of his being, are an unbounded field for reflection; let us therefore strictly tread the facred paths of virtue, which is the only road to true

and complete felicity.

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The PRINCIPLES of POLITENESS,

With necessary Instructions to form a Man of Honour, Taste and Fashion.

Absence of Mind.

ATHAT the world calls an absent man, is, generally, either a very affected one, or a very weak one; but whether weak or affected, he is, in company, a very disagreeable man. Lost in thought, or possibly in no thought at all, he is a stranger to every one present, and to every thing that passes; he knows not his best friends, is deficient in every act of good-manners, unobservent of the actions of the company, and insensible of his own. His answers are quite the reverse of what they ought to be: talk o him of one thing, he replies, as of another. He lorgets what he faid last; leaves his hat in one room, his cane in another, and his fword in a third; nay, f it was not for his buckles, he would even leave his hoes behind him. Neither his arms nor his legs feem to be a part of his body, and his head is never n a right polition. He joins not in the general conversation, except it be by fits and starts, as if awakng from a dream; I attribute this either to weakness or affectation. His shallow mind is possibly not able o attend to more than one thing at a time; or he would be supposed wrapt up in the investigation of ome very important matter. Such men as Sir Isaac Newton, or Mr Locke, might occasionally have some excuse for absence of mind; it might proceed from but intenfeness of thought that was necessary at all imes for the scientific subjects they were studying; but, for a young man, and a man of the world, who

has no such plea to make, absence of mind is a rude ness to the company, and deserves the severest cenfure.

However infignificant a company may be; however trifling their conversation; while you are with them, do not shew them by an inattention that you think them trifling; that can never be the way to please, but rather fall in with their weakness than otherwise; for to mortify, or to thew the least contempt to those we are in company with, is the great est rudeness we can be guilty of, and what few can torgive.

I never yet found a man inattentive to the person he feared, or the woman he loved; which convince me, that absence of mind is to be got the better of, if we think proper to make the trial; and believe me,

it is always worth the attempt.

Absence of mind is a tacit declaration that those not we are in company with are not worth attending to at the and what can be a greater affront?—Besides, can at please absent man improve by what is said or done in his end, presence?—No; he may frequent the best companie as no for years together, and all to no purpose. In short is we a man is neither fit for business nor conversation up to walless he can attend to the object before him, be that y information what it will object what it will.

Knowledge of the World.

A knowledge of the world, by our own experience and observation, is so necessary, that, without it we shall act very absurdly, and frequently give of fence, when we do not mean it. All the learning and parts in the world will not fecure us from it Without an acquaintance with life, a man may fa very good things, but time them fo ill, and addre them so improperly, that he had much better be filent Full of himself and his own business, and inattenting to the circumstances and situations of those he con

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verses with, he vents it without the least discretion, fays things that he ought not to fay; confules some, hocks others, and puts the whole company in pain. lest what he utters next should prove worse than the aft. The best direction I can give you in this mater, is rather to fall in with the conversation of others. to than start a subject of your own : rather strive to put hem more in conceit with themselves, than to draw n.

their attention to you.

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A novice in life, he wno knows in the down as a but what he collects from books, lays it down as a men love flattery; in order therefor fore to please, he will flatter. But, how? Without regard either to circumstance or occasion, Instead of those delicate touches, those fost tints, that serve o heighten the piece, he lays on his colours with a heavy hand, and daubs, where he means to adorn; ofe in other words, he will flatter so unseasonably, and, to; it the same time, so grossly, that while he wishes to please, he puts out of countenance, and is sure to ofthis end. On the contrary, a man of the world, one who mic has made life his study, knows the power of flattery none is well as he; but then, he knows how to apply it; under watches the opportunity, and does it indirectly, that y inference, comparison and hint.

Man is made up of fuch a variety of matter, that, o fearch him thoroughly, requires time and attenion; for, though we are all made of the fame maerials, and have all the same passions, yet, from a ifference in their proportion and combination, we ary in our dispositions; what is agreeable to one is it is liagreeable to another, and what one shall approve, nother shall condemn. Reason is given us to contain the same shall be satisfied. m it foul these passions, but seldom does it. Application tove ineffectual, unless we endeavour at the same dref

me to gain his heart.

Where-ever then you are, fearch into the characis of men; find out, if possible, their soible, their perning passion, or their particular merit; take them on their weak fide, and you will generally funceed; their prevailing vanity you may readily discover, by observing their favourite topic of conversation, for every one talks most, of what he would

be thought most to excel in.

The time should also be judiciously made choice of Every man has his particular times when he may be applied to with success, the mollia tempora fundi; but these times are not all day long; they must be found out, watched, and taken advantage of. You could not hope for success in applying to a man about one business, when he was taken up with another, of when his mind was affected with excess of grief and

ger, or the like.

You cannot judge of other men's minds better than by fluding your own; for though some men have one foible, and another has another, yet men, in gene ral, are very much alike. Whatever pleases or of fends you, will, in fimilar circumstances, please or offend others: if you find yourfelf hurt when another makes you feel his superiority, you will certainly upon the common rule of right, Do as you would he done by, take care not to let another feel your superio rity, if you have it; especially if you wish to gain his interest or esteem. If disagreeable infinuations open contradictions, or oblique fneers, vex and anger you, would you use them where you wished to please Certainly not. Observe then, with care, the opentions of your own mind, and you may, in a great measure, read all mankind.

I will allow that one bred in a cloister or college, may reason well on the structure of the human minds he may investigate the nature of man, and give a tolerable account of his head, his heart, his passions, and his sentiments; but at the same time, he may know nothing of him; he has not lived with him, and of course can know but little how those sentiments or those passions will work—He must be ignorant of the various prejudices, propensities, and an tipathies, that always bias him, and frequently de

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un rmine him. His knowledge is acquired only from heory, which differs widely from practice; and if e forms his judgment from that alone, he must be ften deceived; whereas a man of the world, one the collects his knowledge from his own experience nd observation, is seldom wrong; he is well ac-uainted with the operations of the human mind, but srys into the heart of man; reads his words, before hey are uttered, sees his actions, before they are erformed; knows what will please and what will isplease, and forsees the event of most things.

Labour then to acquire this intuitive knowledge: ttend carefully to the address, the arts and manners f those acquainted with life, and endeavour to imiate them. Observe the means they take, to gain he favour and conciliate the anections of the affociate with; purfue those means, and you will the affociate with; purfue those means, and you will the affociate with a first seem of all that know you.

oon gain the esteem of all that know you.

How often have we seen men governed by persons very much their inferiors in point of understanding, and even without their knowing it? A proof that ome men have more worldly dexterity than others: hey find out the weak and unguarded part, make

heir attack there, and the man furrenders.

Now, from a knowledge of mankind we shall learn the advantage of two things, the command of our temper and countenances; a trifling disagreeable inen eident shall perhaps anger one unacquainted with life, or confound him with shame; shall make him rave ike a madman, or look like a fool; but a man of the world will never understand what he cannot or ought ot to refent. If he should chance to make a slip simfelf, he will stifle his confusion, and turn it off ions, with a jest: recovering it with coolness.

Many people have fense enough to keep their own him ecrets; but from being unused to a variety of comenti-enti-gno is involuntarily declares what they would wish to conceal. This is a great unhappiness, and should, de is soon as possible, be got the better of.

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That coolness of mind and evenness of counter nance, which prevents a discovery of our sentiments. by words, or actions, or our looks, is too necessary to pass unnoticed. A man who cannot hear displeasing things, without visible marks of anger or uneafiness; or pleasing one's, without a sudden burst of joy, a cheerful eye, or an expanded face, is at the mercy of every knave, for either they will defignedly please or provoke you themselves to catch your unguarded looks; or they will feize the opportunity thus to read your very heart, when any other shall do it. You may possibly tell me, that this coolness must be natural, for if not, you can never acquire it. I will admit the force of constitution, but people are very apt to blame that for many things they might readily avoid. Care, with a little reflection, will foon give you this mafter of your temper and your countenance. If you find yourself subject to sudden starts of passion, determine with yourfelf not to utter a fingle word till your reafon has recovered itself; and resolve to keep your countenance as unmoved as possible. As a man who at a card-table can preferve a ferenity in his looks, under good or bad luck, has confiderably the advantage of one who appears elated with fuccess, or call down with ill fortune, from our being able to read his cards in his face, so the man of the world, having to deal with one of these babbling countenances, will take care to profit by the circumstance, let the jour consequence, to him with whom he deals, be as injurious as it may.

In the course of life, we shall find it necessary ven often to put on a pleafing countenance when we are exceedingly displeased; we must frequently seen friendly when we are quite otherwise. I am fensible it is difficult to accost a man with smiles whom we ift p know to be our enemy: but what is to be done? lotic On receiving an affront, if you cannot be justified in wo r knocking the offender down, you must not notice the moth offence; for, in the eye of the world, taking an after some

front calmly is confidered as cowardice.

If fools should attempt at any time to be witty apon you, the best way is not to know their witticifms are levelled at you, but to conceal any uneafiness it may give you; but, should they be so plain that you cannot be thought ignorant of their meaning, I would recommend, rather than quarrel with the company, joining even in the laugh against yourfelf: allow the jest to be a good one, and take it in feeming good humour. Never attempt to retaliate he same way, as that would imply you were hurt. should what is faid wound your honour or your moal character, there is but one proper reply, which I hope you will never be obliged to have recourse to.

Remember there are but two alternatives for a entleman; extreme politeness, or the sword. If a man openly and defignedly affronts you, call him but; but, if it does not amount to an open insult, be outwardly civil; if this does not make him ashamwho will come off with honour Police every by-stander oks, do not respect, is no more a breach of faith, than yan. Your humble servant at the bottom of a challenge; cat they are univerfally understood to be things of course.

Wrangling and quarrelling are characteristic of a have weak mind; leave that to the women, be thou always notes, above it. Enter into no sharp contest, and pride the jourself, in shewing, if possible, more civility to your ntagonist than to any other in the company; this will infallibly bring over all the laughers to your fide, nd the person you are contending with, will be very ikely to confess you have behaved very handsomely broughout the whole affair.

Experience will teach us, that though an men conin we lift principally of the same materials, as I before took
one! totice, yet from a difference in their proportion, no
ed in wo men are uniformly the same; we differ from one
te the mother, and we often differ from ourselves, that is,
in all we sometimes do things utterly inconsistent with the
teneral tenor of our characters. The wisest man

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will occasionally do a weak thing; the most hone man, a wrong thing; the proudest man, a meathing; and the worst of men will sometimes do good thing. On this account, our study of manking should not be general, we should take a frequent view of individuals: and though we may, upon the whole, form a judgment of the man from his prevailing passion, or his general character, yet it will be prudent not to determine, till we have waited to see the operations of his subordinate appetites and humours.

For example; a man's general character may be that of strictly honest. I would not dispute it, be cause, I would not be thought envious or malevolent but I would not rely upon this general character, it as to entrust him with my fortune or my life. Should this honest man, as is not uncommon, be my rise in power, interest, or love, he may possibly do thing that in other circumstances he would abhor; an power, interest, and love let me tell you, will often put honesty to the severest trial, and frequently over power it. I would then ransack this honest man to the bottom, if I wished to trust him, and as I sound him, would place my considence accordingly.

One of the great compositions in our nature is wa mity, to which all men, more or less, give way Women have an intolerable share of it. No flatter no adulation is too gross for them; those who flatte them most please them best, and they are most i love with him who pretends to be most in love wit them: and the least flight or contempt of them never forgotten. It is, in some measure, the same with men: they will fooner pardon an injury that an infult, and are more hurt by contempt than by usage. Though all men do not boast of superior to lents, though they pretend not to the abilities of Pope, a Newton, or a Bolingbroke, every one pro tends to have common fense, and to discharge h office in life with common decency: to arraign therefore, in any shape, his abilties or integrity, 1

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As I would not have you trust too implicitly to a man, because the world gives him a good character; o'I must particularly caution you against these who peak well of themselves. In general, suspect those who boast of, or affect to have any one virtue above all others, for they are commonly impostors. There: are exceptions however to this rule, for we hear of Prudes that have been chaste, Bullies that have been brave, and Saints that have been religious. Confide only where your own observation shall direct you; observe not only what is said, but how it is said; and, if you have any penetration, you may find out the truth better by your eyes than your ears: in short, never take a character upon common report, but enquire into it yourself; for common report, though it. s right in general, may be wrong in particulars.

Beware of those who, on a slight acquaintance, make you a tender of their friendship, and seem to place a confidence in you; 'tis ten to one but they deceive and betray you; however, do not rudely reect them upon such a supposition; you may be civil to them, though you do not entrust them. Silly men: are apt to solicit your friendship, and unbosom themleives upon the first acquaintance: such a friend cannot be worth hearing, their friendship being as slender s their understanding; and if they proffer their friendship with a defign to make a property of you, they are dangerous acquaintances indeed. Not but he little friendships of the weak may be of some use o you; if you do not return the compliment; and it may not be amiss to seem to accept those of designing men, keeping them, as it were in play, that they. may not be openly your enemies; for their enmity s the next dangerous thing to their friendship. may certainly hold their vices in abhorence, without being marked out as their personal enemy. The general rule is to have a real referve with almost every one, and a feeming referve with almost no one; for

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it is very difgusting to seem reserved, and very dan gerous not to be fo. Few observe the true medium Many are ridiculously mysterious upon trisles, and many indifcreetly communicative of all they know.

There is a kind of short-lived friendship that take place among young men, from a connection in their pleafures only; a friendship too often attended with bad consequences. This companion of your ples fures, young and unexperienced, will, probably, it the heat of convival mirth, vow a perpetual friend thip, and unfold himself to you without the least referve; but new affociations, change of fortune, or change of place, may foon break this ill-timed connection, and an improper use be made of it. Be one, if you will, in young companies, and bear your ever part like others in all the focial festivity of youth; com may, trust them with your innocent frolics, but keep pref your serious matters to yourself; and if you must a any time make them known let it be to some tried friend of great experience: and that nothing may diffe tempt him to become your rival, let that friend be in a different walk of life from yourself.

Were I to hear a man making strong protestations, and swearing to the truth of a thing that is in itself probable, and very likely to be, I should doubt his veracity: for when he takes fuch pains to make me

believe it, it cannot be with a good defign.

There is a certain eafiness or false modesty in most young people, that either makes them unwilling, or ashamed to refuse any thing that is asked of them. There is also an unguarded openness about them, that makes them the ready prey of the artful and defign-They are easily led away by the feigned friendflip of a knave or a fool, and too rashly place a confidence in them, that terminates in their loss, and frequently in their ruin. Beware, therefore, as I faid before, of these prosfered friendships; repay them with compliments, but not with confidence Never let your vanity make you suppose that people become your friends upon a flight acquaintance; for

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good offices must be shewn on both sides to create a friendship; it will not thrive, unless its love be mutual; and it requires time to ripen it.

There is fill among young people another kind of friendship merely nominal; warm, indeed, for the time, but fortunately of no long continuance. friendship takes its rife from their pursuing the same course of riot and debauchery; their purses are open to each other, they tell one another all they know, they embark in the same quarrels, and stand by each other on all occasions. I should rather call this a confederacy against good morals and good manners, and think it deserves the severest lash of the law: but they have the impudence to call it friendship. How-you ever, it is often as suddenly distilved as it is hastily with; contracted: fome accident disperses them, and they keep presently forget each other, except it is to betray and of a to laugh at their own egregious folly.

In short, the sum of the whole is, to make a wide may difference between companies and friends; for a very see in agreeable companion has often proved a very dange-

rous friend.

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Attention.

A man is fit for neither business nor pleasure, who either cannot or does not, command and direct his attention to the present object, and in some degree banish for that time, all others from his thoughts. If at a ball, a supper, or a party of pleasure, a man was to be folving his own mind, a problem in Euclid, he would be a very bad companion, and make a poor figure in that company; or if in studying a problem in his closet, he was to think of a minuet, we are apt to believe that he would make a very poor mathematician.

There is time for every thing, if you do but one thing at once; but there is not time sufficient in a rear, if you do two things at a time.

A steady and undissipated attention to one object, is a fare mark of a superior genius; as hurry, bustle, and agitation, are the never failing symptoms of a weak and frivolous mind. You should not only have attention to every thing, but a quickness of attention, so as to observe, at once, all the people in the room; their motions, looks, and words; and yet without staring at them, and seeming to be an observer.

The most material knowledge of all, we mean the knowledge of the world, is never to be acquired with out great attention; and we know many old people who, though they have lived long in the world, are but children still as to the knowledge of it, from their levity and inattention. Certain forms which all people comply with, and certain arts which all people aim at, hide in some degree, the truth, and give go neral exterior refemblance to almost every body; at tention and fagacity fee through that veil, and disco ver the natural character: there are little attentions which are infinitely engaging, and which will fecure us the efteem of mankind; as, for example, suppose you invited any body to dine or sup with you, von ought to recollect if you had observed that they had any favourable dish, and take care to provide it for them; and when it came you should fay, at such i place you gave this dish the preference, therefore! ordered it; this is the wine that I observed you liked and therefore I procured fome: most people have their aversions or their fondness for different things: remove from your friend what he dislikes, and procure for him what he likes, and that will convince him that he is an object worthy of attention, flatten his vanity, and perhaps make him more your friend, than a more important fervice would have done him. Consult your own breast, and recollect how these little attentions, when shewn you by others, flatter that degree of felf-love and vanity, from which no man living is free. Reflect how they incline and attract you to that person, and how you are propitiated as-

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terwards to all which that person says and does; the same causes will have the same effect in your favour.

Aukwardness.

Now aukwardness can proceed but from two caufes; either from not having kept good company, or from not having attended to it. When an aukward man comes into a room, he goes and places himself in the place of the whole company where he should not; there he foon lets his hat fall down, and taking it up again, throws down his stick, in recovering his flick his hat falls a fecond time; fo that it is a quarter of an hour before he is in order again; if he drinks tea or coffee he certainly scalds his mouth and spills the tea or coffee on his breeches; at dinner, his aukwardness distinguishes itself particularly, as he has more to do: he holds his knife, fork, and spoon, differently from other people; eats with his knife to the great danger of his mouth, picks his teeth with his fork, and puts his spoon which has been in his throat twenty times, into the dish again; if he is to carve, he can never hit the joint; but in his vain efforts to cut through the bone, scatters the sauce in every body's face. When he drinks, he infallibly coughs in his glafs and befprinkles the company; besides all this, he has strange tricks and gestures; fuch as fnuffing up his nofe, or blowing it and looking afterwards in his handkerchief, so as to make the company fick; his hands are troublesome to him when he has not something in them, and does not know where to put them; but they are in perpetual motion between his bosom and his breeches: he does not wear his cloaths, and in short does nothing like other people. All this we own is not in any degree criminal; but it is highly disagreeable and ridiculous in company and ought most carefully to be avoided by whoever desires to please.

From this account of what you should not do, you

may eafily judge what you should do; and a due tention to the manners of people of fashion, and wh have feen the world, will make it habitual and fami liar to you.

Bashfulness.

There is a very material difference between mo defty and aukward bashfulness, which is as ridiculou on the as true modesty is commendable: it is as absurd to any be a simpleton as to be an impudent fellow; and we The may make ourselves contemptible, if we cannot come and sinto a room and speak to people without being out of any into a room and speak to people without being out of any into a room and speak to people without being out of any into a roam and speak to people without being out of any in a really distinct, timid, and bashful, be his ment tho what it will, never can push himself on in the world; esty, his despondency throws him into an inaction, and e is the forward the buttling, and the netulent will always sine the forward, the builting, and the petulent will always ains precede him: the manner makes the whole difference; More what would be impudence in one manner, is only afther proper and decent affurance in another. A man of sthe fense, and knowledge of the world, will affert his own sill-rights, and pursue his own objects as steadily and o be intrepidly as the most impudent man living, and com-monly more so: but then he has art enough to give an f co outward air of modesty to all he does. He appears in nsw company with a graceful and proper assurance, and is perfectly eafy and unimberraffed; he is not dazzled omp by superior rank; he pays all the respect that is due erte to it without being disconcerted; and can converte as easily with a king as a peasant. This is the great and advantage of being introduced young into good comis to
pany, and of conversing with our superiors; a well fig bred man will converse with his inferiors without in wer folence, and his superiors with respect and eale. Add to this, that a man of genteel behaviour, though of inferior parts, is better received than a man of superior abilities, who is unacquainted with the na

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orld. Modesty, and a polite, easy affurance, should united.

Modesty,

a polite accomplishment, and generally an attend-

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the polite accomplishment, and generally an attendnt upon merit. It is engaging to the highest detree, and wins the hearts of all our acquaintance.

In the contrary, none are more disgussful in comdustry than the impudent and presuming.

The man who is, on all occasions, commending
tome and speaking well of himself, we naturally dislike.

In the other hand, he who studies to conceal his
who will desert the merit of others,
who does justice to the merit of others,
who talks but little of himself, and that with moorld; city, makes a favourable impression on the persons
and eis conversing with, captivates their minds, and
was an atteir esteem.

Modesty, however, widely differs from an aukward
ally as affulness, which is as much to be condemned
as the other is to be applauded. To appear simple is
own sill-bred as to be impudent. A young man ought
and be able to come into a room and address the comany, without the least embarrassent. To be out
east fountenance when spoken to, and not to have an
as in simple ready, is ridiculous to the last degree.

An aukward country-fellow, when he comes into
ompany better than himself, is exceedingly discondue cred. He knows not what to do with his hands,
crise this hat, but either puts one of them in his pocket,
read of dangles the other by his side; or perhaps twirls
one is hat on his singers, or sumbles with the button.

Well sipoken to, he is in a much worse situation, he anine wers with the utmost difficulty, and nearly stam-

well f spoken to, he is in a much worse situation, he an-in-wers with the utmost difficulty, and nearly stamale, ners; whereas a gentleman, who is acquainted with ugh life, enters a room with gracefulness, and a modest of flurance; addresses even persons he does not know, the nan easy and natural manner, and without the least mbarrassment. This is the characteristic of goodmbarrasiment. This is the characteristic of goodreeding, a very necessary knowledge in our inter-

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burse with men; for one of inferior parts, with the behaviour of a gentleman, is frequently better received than a man of sense, with the address and manners of a clown.

Ignorance and vice are the only things we need be ashamed of: steer clear of these, and you may go into any company you will: not that I would have young man throw off all dread of appearing abroad as a sear of offending, or being disesteemed, will make him preserve a proper decorum. Some persons, from experiencing the inconveniencies of sale modesty, have run into the other extreme, and acquired the character of impudent. This is as great a fault as the other. A well-bred man keeps himself within the two, and steers the middle way. He is easy and firm in every company; is modest, but not bathful; steady, but not impudent. He copies the manners of the better people, and conforms to their customs with ease and attention.

Till we can present ourselves in all companies, with coolness and unconcern, we can never present ourselves well; nor will a man ever be supposed to have kept good company, or ever be acceptable in such company, if he cannot appear there easy, and unsembarrassed. A modest assurance, in every part of life, is the most advantageous qualification we can

possibly acquire.

Instead of becoming insolent, a man of sense, under a consciousness of merit, is more modest. He behaves himself indeed with surmness, but without the least presumption. The man who is ignorant of his own merit, is no less a fool than he who is constantly displaying it. A man of understanding available himself of his abilities, but never boasts of them; whereas the timid and bashful can never push himself in life, be his merit as great as it will; he will be always kept behind by the forward and the bustling. A man of abilities, and acquainted with life, will stand as firm in defence of his own rights, and pusself the his plans as steadily and unmoved, as the most

mpudent man alive; but then he does it with ceming modesty. Thus, manner is every thing; what is impudence in one, is proper assurance only n another; for firmness is commendable, but an

verbearing conduct is disgustful.

Forwardness being the very reverse of modesty, ollow rather than lead the company; that is, join in liscourse upon subjects rather than start one of your win: if you have parts, you will have opportunities mough of shewing them on every topic of conversation; and if you have none, it is better to expose fourself upon a subject of other people's than one of your own.

But, be particularly careful not to speak of yourelf, if you can help it. An impudent sellow lugs a himself abruptly upon all occasions, and is ever the hero of his own story. Others will colour their progance with, 'It may seem strange, indeed, that I should talk in this manner of myself; it is what I by no means like, and should never do, if I had not been cruelly and unjustly accused; but when my character is attacked, it is a justice I owe to myself, to defend it.' This veil is too thin not to be ten through on the first inspection.

Others again, with more art, will modeftly boaft of all the principal virtues, by calling these virtues weaknesses, and saying, they are so unfortunate as to all into weaknesses. 'I cannot see persons suffer,' ays one of this cast, 'without relieving them; though my circumstances are very unable to afford it.' 'I cannot avoid speaking truth, though it is often very

imprudent,' and fo.on.

This angling for praise is so prevailing a principle, that it frequently stoops to the lowest objects. Men will often boast of doing that, which, if true, would be rather a disgrace to them than otherwise. One man assirms that he rode twenty miles within the nour; 'tis probably a lie; but suppose he did, what then? He had a good horse under him, and is a good lockey. Another swears he has often, at a sitting,

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drank five or fix bottles to his own share. Out of respect to him, I will believe him a liar, for I would not wish to think him a beast.

These and many more are the follies of idle people which, while they think they procure them esteen

in reality make them despised.

To avoid this contempt, therefore, never speak of yourfelf at all, unless necessity obliges you; and even then, take care to do it in such a manner, that it may not be construed into fishing for applause, Whatever perfections you may have, be affured people will find them out; but whether they do or not, no-body will take them upon your own word The lefs you fay of yourfelf, the more the world will give you credit for; and the more you fay, the less they will believe you.

Lying.

Of all the vices, there is not one more criminal more mean, nor more ridiculous, than lying. The end we defign by it is very feldom accomplished, for lies are always found out, at one time or other; and yet there are perfons who give way to this vice, who are otherwise of good principles, and have not been ill educated.

Lies generally proceed from vanity, cowardice, and a revengeful disposition, and sometimes from mistaken notion of self-defence.

He who tells a malicious lie, with a view of injuring the person he speaks of, may gratify his wish never for a while, but will, in the end, find it recoil upon himself; for as soon as he is detected, (and detected he certainly will be) he is despised for the infa-mous attempt, and whatever he may say hereafter of with that person, will be confidered as false, whether it them be fo or not.

If a man lies, shuffles, or equivocates, (for, in great fact, they are all alike) by way of excuse for any any puthing he has said or done, he aggravates the offence aute,

rather than lessens it; for the person to whom the ie is told has a right to know the truth, or there would have been no occasion to have framed a falfnood. This person, of course, will think himself ill reated for being a fecond time affronted; for what can be a greater affront than an attempt to impose pon any man's understanding? Besides, lying, in excuse for a fault, betrays fear, than which nothing s more dastardly, and unbecoming the character of gentleman:

There is nothing more manly, or more noble, if we have done wrong, than frankly to own it: It is he only way of meeting forgiveness. Indeed, confesting a fault and asking pardon, with great minds, s considered as a sufficient atonement. 'I have been betrayed into an error,' or 'I have injured you, Sir, and am heartily ashamed of it, and forry for it,' has frequently disarmed the person injured, and, where he would have been our enemy, has made

him our friend.

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The There are persons also, whose vanity leads them for to tell a thousand lies. They persuade themselves, and that, if it be no way injurious to others, it is harmwho less and innocent, and they shelter their falshoods een under the softer name of untruths. These persons are foolish enough to imagine, that if they can recite ice, any thing wonderful, they draw the attention of the company, and if they themselves are the objects of that wonder, they are looked upon as extraordinary in persons. This has made many a man see things that with never were in being, hear things that never were said, pon and achieve feats that never were attempted, dealing the always in the marvellous. Such may be affured, however unwilling the persons they are conversing roll with may be to laugh in their faces, that they hold will tell a lie thus idly, will not scruple to tell a will tell a lie thus idly, will not fcruple to tell a in greater, where his interest is concerned: Rather than any person should doubt of my veracity for one minute, I would deprive myself of telling abroad either

what I had really feen or heard, if such things di

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not carry with them the face of probability.

Others again will boast of the great respect the meet with in certain companies; of the honours that are continually heaped on them there; of the great price they gave for every thing they purchase; and this to be thought of consequence; but, unless such people have the best and most accurate memory, they will, perhaps, very soon after, contradict their former affertions, and subject themselves to contempt and derision.

Remember then, as long as you live, that nothing but first truth can carry you through life with how nour and credit. Liars are not only disagreeable, but dangerous companions; and, when known, will ever be thunned by men of understanding. Besides, as the greatest liars are generally the greatest sools, a man who addicts himself to this detestable vice, will not only be looked upon as vulgar, but will never be considered as a man of sense.

Good-breeding. .

Void of good-breeding, every other qualification will be imperfect, unadorned, and to a certain de-

gree unavailing.

Good-breeding being the result of good sense and good nature, it is not wonderful that people possessed of the one, should be desicient in the other? The modes of it, varying according to persons, places, and circumstances, cannot indeed be acquired otherwise than by time and observation, but the substance is every where and always the same.

What good morals are to society in general, good manners are to particular ones; their bond and security. Of all actions, next to that of performing a good one, the consciousness of rendering a civility is

the most grateful.

We feldom see a person, let him be ever so ill-bred,

wanting in respect to those whom he acknowledges to be his superiors; the manner of shewing this respect, then, is all I contend for. The well-bred manner of sepresses it naturally and easily, while he who is unseled to good company expresses it aukwardly. Study, then, to shew that respect which every one wishes to shew, in an easy and grateful way; but this must be learnt by observation.

In company with your equals, or in mixed companies, a greater latitude may be taken in your behaviour; yet, it should never exceed the bounds of decency; for though no one in this case, can claim any diffinguished mark of respect, every one is enitled to civility and good manners. A man need not, for example, fear to put his hands in his pockets, take fnuff, fit, stand, or occasionally walk about the room: but it would be highly unbecoming to whiftle, wear his hat, loofen his garters, or throw himfelf across the chair. Such liberties are offensive to our equals, and infulting to our inferiors. Eafinefs of carriage by no means implies inattention and careeffness. No one is at liberty to act, in all respects, as he pleases; but is bound by the laws of good manners, to behave with decorum.

Let a man talk to you ever so stupidly or frivolously, not to pay some attention to what he says, is savageness to the greatest degree. Nay, if he even sorces his conversation to you, it is worse than rudeness not to listen to him; for your inattention in this case, tells him, in express terms, that you think him a blockhead and not worth the hearing. Now, is such behaviour is rude to men, it is much more so to women; who, be their rank what it will, have, on account of their sex, a claim to officious attention from the men. Their little wants and whims, their ikes and dislikes, and even their impertinences, are particularly attended to and slattered, and their very thoughts and wishes guessed at, and instantly gratified by every well-bred man.

In promiscuou, companies you should vary your

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address, agreeable to the different ages of the persons you fpeak to. It would be rude and abfurd to talk not of your amours or your pleasures to men of certain dignity and gravity, to clergymen, or men in years; but still you should be as easy with them as with o. thers, your manner only should be varied; you thould, if possible, double your respect and attention to them; and were you to infinuate occasionally that from their observation and experience you wish to profit, you would insensibly win their esteem; for flattery, if not fulfome and gross, is agreeable to all.

When invited to dinner or supper, you must never usurp to yourself the best places, the best dishes, &c. but always decline them, and one; then by a superexcept, indeed, you are offered any thing by a superexcept, if you liked it, not to accept it immediately, without the least apology. Thus, for example, were a superior, the master of the table, to offer you a thing of which there was but one, to pass it to the person next you, would be indirectly charging him that offered it to you, with a want of good manners and proper respect to his company; or, if you were the only firanger prefent, it would be a rudeness if you would make a feint of refuling it with the customary apology, 'I The cannot think of taking it from you,' or, ' fir, I am forry to deprive you of it:' as it is supposed he is lec conscious of his own rank, and if he chose not to give it, would not have offered it; your apology therefore, in this case, is putting him upon an equality with yourself. In like manner, it is rudeness to ura draw back when requested by a superior to pass a door are first, or to step into a carriage before him. In short, to it would be endless to particularize all the instances her in which a wellbred man shews his politeness in good are company, such as not yawning, singing, whistling, o warming his breech at the fire, lounging, putting his houselegs upon the chairs, and the like familiarities every end man's good sense must condemn, and good-breeding no abhor.

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But, good-breeding confilts in more than merely not being ill-bred. To return a bow, speak when you are spoken to, and say nothing rude, are such negative acts of good-breeding, that they are little more than not being a brute. Would it not be a very poor commendation of any man's cleanliness, to lay, that he was not offenfive? If we wish for the good will and efteem of our acquaintance, our goodbreeding must be active, chearful, officious and feducing.

For example, should you invite any one to dine or up with you, recollect whether ever you had oberved them to prefer one thing to another, and enleavour to procure that thing; when at table, fay, At fuch a time, I think you feemed to give this dish a preference, I therefore ordered it. 'This is apo the wine I observed you best like, I have therefore mas been at some pains to procure it.' Trisling as these been at some pains to procure it.' Trifling as these hings may appear, they prove an attention to the person they are said to; and as attention in trifles is

you, the test of respect, the compliment will not be lost. It need only refer to your own breast. How have pre-these little attentions, when shewn you by others, ake a lattered that self-love which no man is free from? , 'I They incline and attach us to that person, and pre-I am udice us afterwards to all that he fays or does. The he is leclaration of the women, in a great degree, stamp of to man's reputation, of being either ill or well-bred; ology ou must then, in a manner overwhelm them with hese attentions; they are used to them, and nates to urally expect them; and, to do them justice, they door resided to them. You must be sedulous short, o wait upon them, pick up with alacrity any thing anest her drop, and he were officious in procuring their hey drop, and be very officious in procuring their good arriages, or their chairs, in public places: be blind what you should not see, and deaf to what you hould not hear. Opportunities of shewing these atevery entions are continually presenting themselves; but eding a case they should not, you must study to create them. bem.

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If ever you would be esteemed by the women, your conversation to them should be always respectiful, lively, and addressed to their vanity. Every thing you say or do, should tend to shew a regard to their beauty or good sense; even men are not without their vanities of one kind or another, and stattering that vanity by words and looks of approbation, is one of the principal characters of good-breeding.

Address and manners, with weak persons, who are actually three-fourths of the world, are every thing; and even people of the best understanding are taken in with them. Where the heart is not won, and the eye pleased, the mind will be seldom on our side.

In short, learning and erudition, without good breeding, is tiresome and pedantic; and an ill-bree man is as unfit for good company as he will be unwelcome in it. Nay, he is full as unfit for business as for company. Make, then, good-breeding the great object of your thoughts and actions. Be particularly observant of, and endeavour to imitate, the behaviour and manners of such as are distinguished for their politeness; and be persuaded, that good breeding is to all worldly qualifications, what charity is to all christian virtues; it adorns merit, and often covers the want of it.

Company.

To keep good company, especially at our first seeing out, is the way to receive good impressions. It consists not wholly of people of birth and rank; for people of neither birth nor rank are frequently and very justly admitted into it, if distinguished by any peculiar merit, or eminence in any liberal art or science. A company wholly composed of learned men, though greatly to be respected, is not meant by the words good company: they cannot have the easy and polished manners of the world, as they do not live

nit; if we can act our part well in fuch a compaay, it will be proper to be in it fometimes, and we hall be more efteemed in other companies, for having place in that, A company confifting wholly of professed wits and poets, is very inviting to young men, who are pleased with it, if they have wit themselves: nd if they have none, are foolishly proud of being one of it: but such companies should be frequented with

noderation and judgment.

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A wit is a very unpopular demnoination, as it caries a terror along with it; and people are as much fraid of a wit in company, as a woman is of a loaded gun which she supposes may go off of itself, and to her a mischief; their acquaintance, however, is worth seeking, and their company worth frequentng; but not exclusively of others, nor to such a egree as to be confidered only as one of that particuar set. Be equally careful to avoid that low comany which in every fense of the word is low indeed; ow in parts, low in manner, and low in merit. Vaity, that fource of many of our follies, and of some four crimes, has funk many a man into company n every light infinitely below him, for the fake of eing the first man in it; there he dictates, is aplauded, and admired, but he foon difgraces and lisqualifies himself for any better company. Let us mitate the real perfections of the good company into which we may get; copy their politeness, their cariage, their address, and the easy and well bred turn f their conversation; but we should remember, that, et them shine ever so bright, their vices, if they ave any, are so many blemishes, which we should r fci. rtificial warts upon our faces, because some very y the low much handsomer he would have been without it.

Rules for Conversation.

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When in company, inform yourself of the characters before you give way to what your imagination may prompt you to say. There are in all companies more who deserve than who like censure: should you therefore expatiate in the praise of some virtue, which some in company notoriously want; or declaim against any vice, which others are notoriously infected with: your restections, however general and unapplied will, by being applicable, be thought personal, and

levelled at those people.

Tell stories but seldom, and absolutely never, but where they are very apt, and very short. Neve hold any body by the button, in order to be hear out; for if people are not willing to hear you, you had much better hold your tongue than they. Lon talkers generally fingle out some person in company to whisper to, this is excessively ill-bred, and in some degree a fraud; conversation-stock being a joint and common property. It is the height of ill-manner to interrupt any person while speaking, by speaking yourfelf, or calling off the attention of the company to any new subject. Take rather than give the sub ject of the company you are in; if you have parts you will shew them, more or less, upon every subject and if you have not, you had better talk fillily upon a subject of other people's, than of your own chusing

Never display your learning but on particular occasions; reserve it for learned men, and let even the rather extort it from you, than appear forward to display it; hence you will be deemed modest, and to puted to have more knowledge than you really have The man who affects to display his learning, will be frequently questioned; and if found superficial, will be ridiculed and despised; if otherwise, he will be deemed a pedant. Nothing can lessen real merit (which

will always shew itself) in the opinion of the world, out an oftentatious display of it by its possessor.

Avoid polemical arguments as much as you can in nixed companies, but when you do oppose or conradict any person's affertion or opinion, let your nanner, your air, your terms, and your tone of voice e soft and gentle, and that easily, and naturally, not seededly. If your oponent be warm, endeavour to hange the conversation, but first finish the argument of dispute with good humoured pleasantry, to shew hat you are neither hurt yourself, nor mean to hurt

our antagonist.

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Upon all occasions avoid speaking of yourself, if the possible, Some abruptly, speak advantageously of themselves, without either pretence or provocation: this is downright impudence. Others proceed for artfully, as they imagine: forging accusations gainst themselves, and complaining of calumnies which they never heard, in order to justify themselves, and exhibit a catalogue of their many virtues; they acknowledge, indeed, it may appear odd, that they should thus talk of themselves, is what they have a great aversion to, and what they could not have done, if they had not been thus abused. This thin til of modesty drawn before vanity, is much too ansparent to conceal it, even from those who have it a moderate share of penetration.

There are a thousand follies and extravagancies hich vanity draws people into, and which always feat their own purpose: the only method of avoidg these evils, is never to speak of ourselves: but hen in a narrative we are obliged to mention ourlves, we should take care not to drop a single word at can directly, or indirectly, be construed as sishing rapplause: be our characters what they will, they ill be known; and nobody will take them upon our on words: nothing that we can say ourselves will mish our defects, or add lustre to our persections; it, on the contrary, it will often make the former ore glaring and the latter obesure. If we are silent

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upon our own merits, neither envy, indignation, nor ridicule, will obstruct or allay the applause which we may really deserve; but if we are our own pane gyrists upon any occasion, however artfully dressed or disguised, every one will conspire against us, and we shall be disappointed of the very end we aim at.

Take care never to feem dark or mysterious; which is not only a very unamiable character, but a very suspicious one too: if you feem mysterious with others they will be really so with you, and you will know nothing. The height of abilities is, to have a frank, open, and ingenious exterior, with a prudent and reserved interior; to be upon your own guard, and yet by a seeming natural openness, to put people off theirs. The majority of every company will avail themselves of every indiscreet and unguarded expression of yours, if they can turn it to their own advantage.

Always look people in the face when you fpeak to them; the not doing it is thought to imply conscious guilt; besides that you loose the advantage of obferving, by their countenances, what impression you discourse makes upon them. In order to know people's real sentiments, we should trust much more to our eyes, than to our ears; for they can say whatever they have a mind we should hear; but they can sed dem help looking what they have no intention we

thould know.

Private scandal should never be received nor retailed willingly; for though the defamation of other may, for the present gratify the malignity or the pride of our hearts, yet cool reflection will draw very disadvantageous conclusions from such a disposition: in scandal, as in robbery, the receiver is always thought as bad as the thief.

Never in conversation, attack whole bodies of an kind: for you may thereby unnecessarily make your felf a great number of enemies. There are good a well as bad of every sect and profession; all general restections upon nations and societies, are the trib

hread-bare jokes of those who set up for wit without saving any. Judge of individuals from your own mowledge of them, and not from their sex, profession, or denomination.

Mimicry, which is the common and favourite anusement of little minds, is held in the utmost concempt with great ones: it is the lowest and most illiperal of all bussoonery: we should neither practise it, nor applaud it in others: besides that, the person mimicked is insulted; and an insult is not easily forwiven.

We may frequently hear some people in good comeany, interlard their conversation with oaths, by way of embellishment, as they suppose; but swearing without having a single temptation to plead, is as filly and as illiberal as it is wicked.

In conversation be explicit, for nothing makes a man look sillier in company, than a joke or pleasant-y not relished, or not understood; and, if he meets with a profound silence when he expected a general applause; or what is still worse, if he is desired to explain a joke, his aukward and embarrassed situation is easier imagined than described.

Be careful how you repeat in one company what you hear in another. Things seemingly indifferent may, by circulation, have much graver consequences than may be imagined. There is a kind of general acit trust in conversation, by which a man is engaged not to report any thing out of it, though he is not immediately enjoined to secrecy. A retailer of this kind draws himself into a thousand scrapes and discussions and is shilly and indifferently received wherever he goes.

Always adapt your conversation to the people you are conversing with: for I suppose you would not alk upon the same subject, and in the same manter, to a bishop, a philosopher, a captain, or a woman.

A certain degree of exterior ferioufness in looks and motions gives dignity, without excluding wit and

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decent cheerfulness. A constant smirk upon the face and a whaissing activity of the body, are strong indications of sutility.

Genteel Carriage.

Next to good-breeding is a genteel manner and carriage, wholly free from those ill habits and aukward actions, which many very worthy persons are addicted to.

A genteel manner of behaviour, how trifling foever it may seem, is of the utmost consequence in private life. Men of very inferior parts have been esteemed, merely for their genteel carriage and good-breeding, while sensible men have given disgust for want of it. There is something or other that prepossesses us at first fight in favour of a well-bred man, and makes u wish to like him.

When an aukward fellow first comes into a room he attemps to bow, and his fword, if he wears one goes between his legs, and nearly throws him down Confused and ashamed he stumbles to the upper end of the room, and feats himself in the very chair he should not. He there begins playing with his hat which he presently drops; and recovering his hat, he lets fall his cane; and in picking up his cane, down goes his hat again; thus 'tis a confiderable time before he is adjusted. When his tea or coffee is handed to him, he spreads his handkerchief upon his knees, fealds his mouth, drops either the cup or the faucer, and spills the tea or coffee in his lap. At dinner he is more uncommonly aukward; there he tuck his napkin through a button-hole, which tickles his chin, and occasions him to make a variety of wry faces; he feats himfelf upon the edge of the chair, at fo great a distance from the table, that he frequent ly drops his meat between his plate and his mouth he holds his knife, fork, and spoon differently from other people: eats with his knife, to the manifest danger of his mouth: picks his teeth with his fork, rake

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his mouth with his finger, and puts his spoon, which as been in his throat a dozen times, into the dish gain. If he is to carve, he cannot hit the joint; out, in labouring to cut through the bone, splashes he fauce over every bodies cloaths. He generally aubs himself all over; his elbows are in the next erson's plate, and he is up to the knuckles in soup and rease. If he drinks it is with his mouth full, interruptng the whole company with 'To your good health, ir,' and ' My service to you;' perhaps coughs in his lass, and besprinkles the whole table. Further, he has perhaps a number of disagreeable tricks, he snuffs op his nose, picks it with his fingres, blows it, and ooks in his handkerchief, crams his hands first into his bosom, and next into his breeches. In short, he heither dreffes or acts like any other person, but is particularly aukward in every thing he does. All his, I own, has nothing in it criminal; but it is such in offence to good manners and good-breeding that it suniverfally despised; it makes a man rediculous in every company, and, of course, ought carefully to be woided by every one who would wish to please.

From this picture of the ill-bred man, you will assily discover that of the well-bred, for you may realily judge what you ought to do when you are told what you ought not to do, a little attention to the manners of those who have seen the world, will make aproper behaviour habitual and samiliar to you.

Actions, that would otherwise be pleasing, frequently become ridiculous by your manner of doing them. If a lady drops her fan in company, the worst-ored man would immediately pick it up, and give it to her; the best bred man can do no more, but then, he does it in a graceful manner, that is sure to please whereas the other would do it so aukwardly as to be laughed at.

You may also know a well-bred person by his manner of fitting. Ashamed and confused, the aukward nan sits in his chair stiff and bolt upright, whereas he man of fashion, is easy in every position; instead.

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of lolling or lounging as he fits, he leans with elegance, and by varying his attitudes, shews that he has been used to good company. Let it be one part of your study then, to learn to fit genteelly in different companies, to loll gracefully where you are authorized to take that liberty, and to fit up respectfully, where that freedom is not allowable.

In short, you cannot conceive how advantageous a graceful carriage and a pleasing address are, upon all occasions; they ensure the affections, steal a prepossession in our favour, and play about the heart till

they engage it.

Now, to acquire a graceful air, you must attend to your dancing; no one can either sit, stand or walk well, unless he dances well. And, in learning to dance, be particularly attentive to the motion of you arms, any stiffness in the wrist will make a man look aukward. If a man walks well, presents himself well in company, wears his hat well, moves his head properly, and his arms gracefully, it is almost all that is necessary.

There is also an aukwardness in speach that naturally falls under this head, and ought to, and may be guarded against; such as forgetting names, and miltaking one name for another; to speak of Mr What-d'ye call-him, or, You-know-who, Mrs Thingum, What's her-name, or, How-d'ye-call-her, is exceeding aukward and vulgar. 'Tis the same to address people by improper titles, as Sir for My Lord; to begin a story without being able to finish it, and break off in the

middle, with, ' I have forgot the reft.'

Our voice and manner of fpeaking too, should like wife be attended to. Some will mumble over their words, so as not to be intelligible, and others will speak so fast as not to be understood, and, in doing this, will sputter and spit in your face; some will bawl as if they were speaking to the deaf; others will speak so low as scarcely to be heard; and many will put their face so close to yours as to offend you with their breath. All these habits are harried and discovered their strength of the same harried and discovered the same harried the

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ele gultful, but may easily be got the better of, with are. They are the vulgar characteristics of a lowored man, or are proofs that very little pains have een bestowed in his education. In short, an attenion to these little matters are of greater importance han you are aware of; many a fensible man having oft ground for want of these little graces, and many one, possessed of these perfections alone, having nade his way through life, and that otherwise, would not have been noticed.

Cleanliness of Person.

But, as no one can please in company, however raceful his air, unless he be clean and neat in his person, this qualification comes next to be considered.

Negligence of one's person not only implies an unufferable indolence, but an indifference whether we lease or not. In others, it betrays an insolence and fectation, arising from a presumption, that they are ure of pleasing, without having recourse to those

seans which many are obliged to use.

He who is not thoroughly clean in his person, will e offensive to all he converses with. A particular egard to the cleanliness of your mouth, teeth, hands, nd nails, is but common decency. A foul mouth nd unclean hands are certain marks of vulgarity; he first is the cause of an offensive breath, which obody can bear, and the last is declarative of dirty rork. One may always know a gentleman by the ate of his hands and nails. The flesh at the roots hould be kept back, so as to shew the semicircles at he bottom of the nails; the edges of the nails should ever be cut down below the ends of the fingers, nor hould they be suffered to grow longer than the finers. When the nails are cut down to the quick. is a shrewd fign that the man is a mechanic, to shom long nails would be troublesome, or that he ets his bread by fiddling; and if they are longer than

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his fingers ends, and encircled with a black rim, if foretells he has been laboriously and meanly employ ed, and too fatigued to clean himself; a good apology for want of cleanliness in a mechanic, but the greatest disgrace that can attend a gentleman.

These things may appear too insignificant to be mentioned; but when it is considered that a thousand little nameless things, which every one feels but mone can describe, conspire to form that whole of pleasing, I hope you will not call them triffling. Be sides, a clean thirt and a clean person are as necessare to health, as not to offend other people. It is a maxim with me, which I have lived to see verified, that he who is negligent at twenty years of age, will be sloven at forty, and intollerable at fifty.

Drefs.

Neatness of person, I observed, was as necessarya cleanliness; of course, some attention must be paid to your dress.

Such is the abfurdity of the times, that to pass well with the world, we must adopt some of its cul-

toms, be they ever fo ridiculous.

In the first place, to neglect one's dress is to affront all the semale part of our acquaintance. The women in particular pay an attention to their dress to neglect therefore yours will displease them, as it would be tacitly taxing them with vanity, and declaring that you thought them not worth that respect which every body else does. And, as I have mentioned before, as it is the women who stamp a young man's credit in the fashionable world, if you do not make yourself agreeable to the women, you will alfuredly lose ground among the men.

Dress, as tristing as it may appear to a man of understanding preposses on the first appearance, which is trequently decisive. And indeed we may form some opinion of a man's sense and character from his dress. Any exceeding of the fashion, of

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f unance, may acter any affectation in dress whatever, argues a weakness in understanding, and, nine times out of ten it will be found so.

There are few young fellows but what display some character or other in this shape. Some would be thought fearless and brave; these wear a black cra-vat, a short coat and waistcoat, an uncommon long (word hanging to their knees, a large hat fiercely cocked, and are flash all over. Others affect to be country 'squires; these will go about in buckskin breeches, brown frocks, and great oaken cudgels in their hands, flouched hats, with their hair undreffed, and tucked up under them to an enormous fize, and mitate grooms and country boobies fo well externally, that there is not the least doubt of their resembing them as well internally. Others, again, paint and powder themselves so much, and dress so finically, as leads us to suppose they are only women in boy's cloathes. Now, a fensible man carefully avoids all this, or any other affectation. He dresses as fashionably and as well as persons of the best families and best sense; if he exceeds them, he is a coxcomb: If he dreffes worse, he is unpardonable.

Dress yourself fine, then, if possible, or plain, agreeable to the company you are in; that is, conform to the dress of others, and avoid the appearance of being tumbled. Imitate those reasonable people of yeur own age, whose dress is neither remarked as too neglected or too much studied. Take care to have your clothes well made, in the fashion, and to sit you, or you will, after all, appear aukward. When once dressed, think no more of it: shew no lear of discomposing your dress, but let all your motions be as easy and unembarrassed, as if you was at

nome in your dishabille.

Elegance of Expression.

Having mentioned elegance of person, I will pro-

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ceed to elegance of expression.

It is not one or two qualifications alone complete the gentleman; it must be an union of many; and graceful speaking is as essential as a graceful perfon. Every man cannot be an harmonious speaker; a roughness or coarseness of voice may prevent it; but if there are no natural impersections, if a man does not stammer or lisp, or has not lost his teeth, he may speak gracefully; nor will all these defects, if he has a mind to it, prevent him from speaking

correctly.

Nobody can attend with pleasure to a bad speaker. One who tells his story ill, be it ever fo important, will tire even the most patient. If you have been present at the performance of a good tragedy, you have doubtless been sensible of the good effects of a speech well delivered; how much it has interested and affected you; and, on the contrary, how much an ill spoken one has disgusted you. 'Tis the same in common conversation; he who speaks deliberately, distinctly, and correctly; he who makes use of the best words to express himself, and varies his voice according to the nature of the subject, will always please, while the thick or hasty speaker; he who mumbles out a fet of ill-chosen words, utters them ingrammatically, or with a dull monotony, will tire and difgust. Be affured then, the air, the gesture, the looks of a speaker, a proper accent, a just emphasis and tuneful cadence, are full as necessary to please and be attended to, as the subject matter itself.

People may talk what they will of folid reasoning and sound sense; without the graces and ornaments of language, they will neither please nor persuade. In common discourse, even trisses elegantly expressed will be better received than the best of arguments

homespun and unadorned.

A good way to acquire a graceful utterance is to read aloud to some friend every day, and beg of him to fet you right, in case you read too fast, do not obferve the proper stops, lay a wrong emphasis, or utter your words indistinctly. You may even read aloud o yourfelf, where such a friend is not at hand, and and you will find your own ear a good corrector. are to open your teeth when you read or speak, and articulate every word diffinctly; which last cannot be lone, but by founding the final letter. But above all, endeavour to vary your voice, according to the matter, and avoid a monotony. By a daily attenion to this, it will, in a little time, become easy and habitual to you.

Pay an attention also to your looks and your gelures, when talking, even on the most trifling subjects; hings appear very different according as they are ex-

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Now, if it is necessary to attend so particularly to our manner of speaking, it is much more so, with espect to the matter. Fine turns of expression, a genteel and correct style, are ornaments as requisite o common fense, as polite behaviour and an elegant address are to common good-manners; they are great assistants in the point of pleasing. A gentleman, it is rue, may be known in the meanest garb, but it admits not of a doubt, that he would be better received into good company, genteely and fashionably drefled, than was he to appear in dirt and tatters.

Be careful then of your ftyle upon all occasions; whether you write or speak, study for the best words and best expressions, even in common conversation, or the most familiar letters. This will prevent your peaking in a hurry, than which, nothing is more vulgar; though you may be a little embarrassed at first, ime and use will render it easy. It is no such dificult thing to express ourselves well on subjects we are thoroughly acquainted with, if we think before we speak; and no one should presume to do otherwife. When you have faid a thing, if you did not

reflect before, be fure to do it afterwards; consider with yourself whether you could not have expressed yourself better; and if you are in doubt of the propriety or elegancy of any word, search for it in some dictionary, or some good author, while you remember it: never be sparing of your trouble while you would wish to improve, and take my word for it, a very little time will make this matter habitual.

In order to speak grammatically, and to express
yourself pleasingly, I would recommend it to you to
translate often any language you are acquainted with
into English, and to correct such translation till the
words, their order, and the periods, are agreeable to

your own ear.

Vulgarism in language is another distinguishing mark of bad company and education. Expressions may be correct in themselves and yet be vulgar, owing to their not being fashionable: for language, as well as manners, are both established by the usage of

people of fashion.

The conversation of a low-bred man is filled up with proverbs and hackneyed fayings. Instead of observing that tastes are different, and that most men have one peculiar to themselves, he will give you, What is one man's meat is another man's poison! or, ' Every one to their liking, as the old woman faid, when she kissed her cow.' He has ever some favourite word, which he lugs in upon all occasions, right or wrong; fuch as, Vaftly angry, Vaftly kind, Devilish ugly, Devilish handsome, Immensely great, Immensely little. Even his pronounciation carries the mark of vulgarity along with it; he calls the earth, yearth; finan-ces, fin-ances; he goes to wards, and not towards fuch a place. He affects to ule hard words, to give him the appearance of a man of learning, but frequently mistakes their meaning; and feldom, if ever, pronounces them properly.

All this must be avoided, if you would not be supposed to have kept company with sootmen and house maids. Never have recourse to proverbial or vulgat To raiccreal,

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lyings; use neither favourite nor hard words, but cek for the most elegant; be careful in the management of them, and depend on it your labour will not e loft; for nothing is more engaging than a fashionble and polite address.

Friendship.

The greatest sweetner of human life is friendship; o raise this to the highest pitch of enjoyment, is a ecret which but few discover. Friendships in geneal, are suddenly contracted; and therefore it is no wonder they are easily dissolved. Young persons ave commonly an unguarded frankness about them, which makes them the easy prey and bubbles of the atful and experienced; they look upon every person who tells them he is their friend to be really fo; and to be yethat profession of simulated friendship with an ndiscreet and unbounded confidence, always to their ofs, often to their ruin. Beware of these proffered riendships; receive them with civility but with great ncredulity too; and pay them with compliments. out not with confidence: do not suppose that people vill become friends at first fight, or even upon a shore equaintance: real friendship is a slow grower; and ever thrives, unless ingrafted upon a slock of known nd reciprocal merit.

There is a kind of nominal friendship amongst young cople, which is warm for a time, but luckily of thort uration: this friendship is hastily produced, by their eing accidentally thrown together, and pursuing the ame course of riot and debauchery: a fine friendship. ruly! and well cemented by drunkenness and lewdness! it should rather be called a conspiracy against norals and good-manners, and be punished as such y the civil magistrate: however they have the folly o call this confederacy a friendship. They oft enage in quarrels, offensive and defensive for their lgat accomplices; they tell one another all they know, and

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often more too; when of a sudden some accident disperses them, and they think no more of each other, unless it be to betray and laugh at their imprudent confidence.

A man who has amused us for an evening with sprightly conversation, shall be admitted into the number of our friends, and received with that arder which is always the attendant upon the first impression of regard: but though wit be an agreeable, it is by no means the only qualification necessary in a friend; and is of all others the most precarious soundation of esteem. Qualifications that make a man the object of general applause, are not in themselves

fufficient to conciliate our friendly regards.

Remember to make a great difference between companions and friends; for a very complaifant and agreeable companion may, and often does, prover very improper and a very dangerous friend. People will in a great degree, form their opinion of you, upon that which they have of your friends, 'Tell me with whom you keep company, and I will tell you what you are.' One may fairly suppose, that a man, who makes a knave or a fool his friend, has fome thing very bad to do, or to conceal: but at the same time, that you carefully decline the friendship of knaves and fools, if it can be called friendship, there is no occasion to make either of them your enemies, wantonly and unprovoked; for they are numerous bodies; and one would rather chuse a secure neutrality, than alliance or war with either of them: you may be a declared enemy to their vices or follies, without being marked out by them as a personal one Their enmity is the next dangerous thing to their friendship: have a real reserve with almost every bobody; and have a feeming referve with almost nobody; for it is very disagreeable to seem reserved, and very dangerous not to be fo. Few people find the true medium; many are ridiculously mysterious and

elerved upon trifles; and many imprudently comnunicative of all they know.

Look round the world, and you will fee men emloyed in such pursuits, and disturbed with such pasons, as make friendship appear an empty name, and mimaginary existence. Most breasts are so conacted by felfish and mercenary principles, that they

re incapable of feeling any of the finer movements. nd reciprocations of benevolence; and even where ature has softened the heart to this delicate sensiility, the has, perhaps, confiderably abated its operaion, by principles and habits of a contrary kind. ome are fusceptible of the warmest affection, quick

o the call of necessity, and ready to relieve and sucour distress; but then they lie open to the attack of very fofter passion, and have not fortitude sufficient

and o reason down these rising propensities of nature in-

ople Others from selfishness and pride, shall lend an ear, up to the whisper of malignity and envy; others have me leasts soft to every impression; and in these, one you eal of friendship is obliterated by another; while man, some by a mutable disposition of mind, relinquish one heir friends, not because they cease to be, but con-

same inue what they once were: but when we come to effect, on the one hand, that friendship, in order to there be true and lasting, must know no rival or referve,

ave similar virtues for its foundation, and mutual steem for its support; and when we consider on the ther, the fuspicions of pride, the love of superiority,

nd the natural distrust of the human heart, we shall oon find that Socrates made a right estimate of friendhip, and that a very small mansion will contain those which any man can truly call as such, and, as Dr.

loung very justly observes;

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But fince friends grow not thick on every bough, Nor ev'ry friend unrotten at the core; First on thy friend, delib'rate with thyself; Paule, ponder, fift; nor eager in the choice,

Nor jealous of the chosen: fixing, fix; Judge before friendship; then conside till death!

But though we may not arrive at all that happiness which we are assured a pure friendship is capable of affording, yet this ought not to make us indolent in our researches, or indifferent in our regards: that man would be thought very unreasonable, who should refuse to partake of the elegancies which his own country affords, because other regions surnish our greater delicacies; for as the author just quoted, says

Friendship's the wine of life; but friendship new
Is neither strong nor clear:
O! for the bright complexion, cordial warmth
And elevating spirit of a friend,
For twenty summers rip'ning by my side;
All seculence of salshood long thrown down;
All social virtues rising in his soul;
As chrystal clear: and, smiling as they rise!
Here nectar flows; it sparkles in our sight;
Rich to the taste, and genuine from the heart.'

The very constitution of our minds leads us immediately to the cultivation of friendship; for

· Poor is the friendless master of a world: A world in purchase for a friend is gain.'

Though the powers of the mind are great, yet, the wider they expand, the less forcible they all that benevolence we feel towards all mankind, is of so undeterminate a nature, that when the general calamities of our fellow-creatures are represented to us, where, perhaps, whole nations are immediate sufferers, we enter not into that sympathy which we should feel for one family or friend in distress. We shall always find, that, in exact proportion as the objects of our benevolence decreases, the more warm and lively our benevolence operates. The good of the political community to which we belong, is more

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he object of our regards than the community of the world; that of our families and friends, more than hat of the political community; and that of an inlividual, is still more facred and dear. Here our rerards center upon an absolute object, and there is more than general calamity to affect us. When one particular ear is open to our complaints; when we fee one breaft filled with fympathy; the eye of an indiidual flowing with a tear of compassion, or glad with the sparkling of joy: we imagine this to be an extraordinary instance of that humanity, which, in every instance, gains our esteem and approbation, but

when shewn to ourselves esteem and love.

The requifites of friendship, are confidence, love, and effeem; fuch as are founded upon similar perfecions of character, or fimilar tafte, with no more opposition of sentiment, than what shall sometimes prove a gentle excitement to an amicable dispute. We cannot confide in the man whose moroseness. makes him reserved, any more than in him, whose levity makes him liable to change; we cannot trust the man of pride, or commit a fecret to his keeping, who is always unguarded: we must both love and efteem the person we admit to our friendship; because a man may possess qualities which may produce love, and no esteem; or esteem without love; the former is founded on qualifications that please: the latter on those that command approbation. We in some fort, love ourselves in our friend, and are glad, from a defire of appearing difinterested, to make a joint offering to benevolence, and felf-love. The foundation of this must be, the similarity between ourselves and our friend: the same taste that leads, to the same pleasures, binds us forcibly with the cords of affection. We love to recollect, much more constantly converse, with objects with which we have connected the most agreeable ideas: and by this joint participation, we give a continuance to pleasures otherwise fugitive, and of precarious remembrance. Such an opposition of sentiment in friendship must

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different parties; in contentions, which these produce, friendship has been often destroyed, without

the conviction of either of the opponents.

When once we have made choice of a friend, le the care to keep him be equal to the value of the pol fession we enjoy: and let us remember the impersea tions of humanity, and expect not too much eren from friendship irself. We may trust in the fincerin of a friend; but there are fecrets which no other breaft but our own should be conscious of. We may reveal many griefs, but a portion ought to be refer ved as a trial of our own fortitude. We may communicate many pleafures, yet still have some in referve: there will be feafons when these may amuse and when a friend cannot delight. Friendship mar be made subservient to the noblest purposes of human life: though it will not allow of direct opposition of fentiment, or the contention of superiority, yet it admits of a generous emulation who shall excel in all the amiable virtues, that connect mankind in the inviolable union of focial benevolence.

We should chuse a friend endued with virtue, as a thing in itself lovely and desirable: which consists in a sweet and obliging temper of mind, and a lively

readiness in doing good offices. Plutarch.

True friends are the whole world to one another; and he that is a friend to himself is also a friend to mankind. There's no relish in the possession of any thing without a partner. Senesa.

It was ever my opinion, fays Horace, that a chearful good-natured friend is fo great a bleffing, that it

admits of no comparrison but itself.

Prosperity is no just scale; advertity is the only

ballance to weigh friends.

The best friendship is to prevent a request, and never put a man to the confusion of asking. To ask, is a word that lies heavily on the tongue, and cannot well be uttered but with a dejected countenance.

We should therefore strive to meet our friend in his wishes, if we cannot prevent him.

A faithful friend is the medicine of life, and his

excellency is invaluable.

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Laughter.

Frequent and loud laughter is a fure fign of a weak mind, and no less characteristic of a low education. It is the manner in which low-bred men express their filly joy, at filly things; and they call it being merry.

I do not recommend, upon all occasions, a solemn countenance: A man may smile, but if he would be thought a gentleman, and a man of sense, he would by no means laugh. True wit never made a man of sathion laugh; he is above it. It may create a smile, but as loud laughter shews, that a man has not the command of himself, every one, who would wish to appear sensible, must abhor it.

A man's going to fit down, on a supposition that he has a chair behind him, and falling for want of one, occasions a general laugh, when the best pieces of wit would not do it:—a sufficient proof how low

and unbecoming laughter is.

Besides, could the immoderate Laugher hear his own noise, or see the faces he makes, he would despise himself for his folly. Laughter being generally supposed to be the effect of gaiety, its absurdity is not properly attended to; but a little resection will easily restrain it, and when you are told, it is a mark of low breeding, I persuade myself you will endeavour to avoid it.

Some people have a filly trick of laughing, whenever they speak; so that they are always on the grin, and their faces are ever distorted. This, and a thou-fand other tricks, such as scratching their heads, twirling their hats, sumbling with their button, playing with their fingers, &c. are acquired from a false modely at their first outset in life. Being shame-

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faced in company, they try a variety of ways to keep themselves in countenance; thus they fall into those aukward habits I have mentioned, which grow upon

them, and in time become habitual

Nothing is more repugnant likewise to good-breed, ing than horse-play of any fort, romping, throwing things at one another's heads, and so on. They may pass well enough with the mob, but they lessen and degrade the gentleman.

Sundry little Accomplishments.

(From Lord Chefferfield.)

1. To do the honours of a table gracefully, is one of the outlines of a well-bred man; and to carve well is an article, little as it may feem, that is useful twice every day, and the doing of which ill, is not only troublesome to one's self, but renders us disagreeable and rediculous to others. We are always in pain for a man, who, instead of cutting up a fowl genteely, is hacking for half an hour across the bone, greasing himself, and bespattering the company with the sauce. Use, with a little attention, is all that is requisite to acquit yourself well in this particular.

2. To be well received, you must also pay some attention to your behaviour at table, where it is exceedingly rude to scratch any part of your body, to spit, or blow your nose, if you can possibly avoid it, to eat greedily, to lean your elbows on the table, to pick your teeth before the dishes are removed, or to

leave the table before grace is faid.

3. Drinking of healths is now growing out of fashion, and is very unpolite in good company. Custom once had made it universal, but the improved manners of the age now renders it vulgar. What can be more rude or ridiculous than to interrupt persons at their meals with an unnecessary compliment? abstain then from this silly custom, where you find it out of use;

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and use it only at those tables where it continues ge-

4. A polite manner of refuling to comply with the olicitations of a company, is also very necessary to be earned; for, a young man, who feems to have no will of his own, but does every thing that is asked of him. may be very good-natured fellow, but he is a very illy one. If you are invited to drink, at any man's house, more than you think is wholesome, you may ay, 'You wish you could, but that so little makes you both drunk and fick, that you shall only be bad company by doing it :' of courfe, beg to be excused. defired to play at cards deeper than you would, reuse it ludicrously; tell them, ' If you were fure to lofe, you might possibly fit down; but that, as fortune may be favourable, you dread the thought of having too much money, ever fince you found what an incumbrance it was to poor Harlequin, and therefore you are resolved never to put yourself in the way of winning more than fuch or fuch a fum a-day.' This light way of declining invitations to vice and olly, is more becoming a young man than philosophical or fententious refusals, which would only be aughed at.

5. Now I am on the subject of cards, I must not mit mentioning the necessity of playing them well, and genteely, if you would be thought to have kept good company. I would by no means recommend playing at cards as a part of your study, lest you hould grow too fond of it, and the consequences prove and. It were better not to know a diamond from a lab, than to become a gambler; but, as custom has attroduced innocent card playing at most friendly neetings, it marks the gentleman to handle them gentlely, and play them well: and as I hope you will play only for small sums, should you lose your money may lose it with temper; or win, receive your win-

ings without either elation or greediness.

6. To write well and correct, and in a pleasing tile, is another part of polite education. Invery man

who has the use of his eyes, and his right-hand, can write whatever hand he pleases. Nothing is so illisteral as a school-boy's scrawl. I would not have you learn a stiff formal hand-writing, like that of a school-master, but a genteel, legible, and liberal hand, and to be able to write quick. Asto the correctness and elegancy of your writing, attention to grammar does the one, and to the best authors the other. Epistolary correspondents should not be carried on in a studied or affected stile, but the language should flow from the pen, as naturally, and as easily, as it would from the mouth. In short, a letter should be penned in the same style as you would talk to your friend, if he was present.

7. If writing well shews the gentleman, much more so does spelling. It is so effentially necessary for a gentleman, or a man of letters, that one falle fpelling may fix a ridicule on him for the remainder of his life. Words in books are generally well spelled, according to the orthography of the age; reading, therefore, with attention, will teach every one to spell right. It fometimes happens that words shall be spelled differently by different authors: but if you spell them upon the authority of one, in estimation of the public, you will escape redicule. Where there is but one war of fpelling a word, by your spelling it wrong, you will be fure to be laughed at. For a woman of a tolerable education would laugh at, and despise her lover, if he wrote to her, and the words were ill spelled. Be particularly attentive then to your spelling,

8. There is nothing that a young man, at his first appearance in life, ought more to dread, than having any ridicule fixed on him. In the estimation, even of the most rational men, it will lessen him, but ruin him with all the rest. Many a man has been undone by a ridiculous nick-name. The causes of nick-names, among well bred man, are generally the little desects in manner, air or address. To have the appellation of ill-bred, aukward, muttering, lest-legged, or any other tacked always to your name, would injure you more

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han you are aware of; avoid then these little desects, and they are easily avoided) and you need never car a nick-name.

o. Some young men are apt to think, that they cannot be complete gentlemen, without becoming men of pleasure; and, the rake they often mistake for heman of pleasure. A rake is made up of the meanest and most difgraceful vices. They all combine to degrade his character, and ruin his health and fortune. A man of pleasure will refine upon the enjoyments of the age, attend them with decency, and partake of of them becomingly. Indeed he is too often less ferupulous than he should be, and frequently has cause to repent it. A man of pleasure, at best, is but a diffipated being, and what the rational part of mankind must abhor; I mention it, however, lest, in taking up the name of pleasure, you should fall into the rake; for, of two evils, always chuse the least. A desolute flagitious footman may make as good a rake as a man of the first quality. Few men can be men of pleasure: every man may be a rake. There is a certain dignity that should be preserved in all our pleasures: In love, a man may lose his heart, without losing his note; at table, a man may have a distinguishing palate, without being a glutton; he may love wine without being adrunkard; he may game without being a gambler; and so on. Every virtue has its kindred vice, and every pleafure its neighbouring difgrace. Temperance and moderation mark the gentleman; but excess the blackguard. Attend carefully, then, to the line that divides them; and remember, stop rather a yard short, than step an inch beyond it. Weigh the present enjoyment of your pleasures, against the necessary consequences of them, and I will leave you to your own determination.

to. A gentleman has ever some regard also to the choice of his amusements. If at cards, he will not be seen at cribbage, allfours, or putt: or, in sports of exercise, at skittles, soot-ball, leap-frog, cricket, driving of coaches, &c. but will preserve a propriety

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in every part of his conduct: knowing that any instation of the manners of the mob, will unavoidable stamp him with vulgarity. There is another amule ment too, which I cannot help calling illiberal, the is, playing upon any musical-instrument. Musical commonly reckoned one of the liberal arts, and undoubtedly is so: but to be piping or siddling at a concert is degrading to a man of fashion. If you long music, hear it: pay siddlers to play to you, but need siddle yourself. It makes a gentleman appear fried lous and contemptible, leads him frequently into have company, and wastes that time which might otherwise be well employed.

ing. Be careful never to tell in one company what you see or hear in another; much less to divert the present company at the expence of the last. Thing apparently indifferent may, when often repeated and told abroad, have much more serious consequences than imagined. In conversation there is generally a tacit reliance, that, what is said will not be repeated; and a man, though not enjoined to secrecy, will be excluded company, if found to be a tatler: besides, he will draw himself into a thousand scrapes, and crop

one will be afraid to speak before him.

either at home or abroad, is a mark of ill-breeding; if at home, it appears as if you were tired of your company, and wished them to be gone; if abroad, as if the hours dragged heavily, and you wished to be gone yourself. If you want to know the time, withdraw; besides, as the taking what is called a French leave was introduced, that on one person's leaving the company the rest might not be desturbed, looking at you watch does what that peace of politeness was designed to prevent; it is a kind of dictating to all present, and telling them it is time, or almost time, to break up.

13. Among other things, let me caution you again ever being in a hurry; a man of fense may be in

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afte, but he is never in a hurry, convinced that hurry the furest way to make him do, what he underikes, ill. To be in a hurry is a proof that the busiess we embark in is too great for us; of course, it is
he mark of little minds, that are puzzeled and perlexed, when they should be cool and deliberate; they
ish to do every thing at once, and are thus able to
o nothing. Besteady, then, in all your engagements;
ook round you before you begin; and remember, that
ou had better do half of them well, and leave the
est undone, than to do the whole indifferently.

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r4. From a kind of false modesty, most young nen are apt to consider familiarity as unbecoming. Forwardness I allow is so; but there is a decent familiarity that is necessary in the course of life. Mere ormal visits, upon formal invitations, are not the hing; they create no connection, nor will they prove if service to you; it is the careless and easy ingress tall hours, that secures an acquaintance to our increst, and this is acquired by a respectful samiliarity intered into, without sorfeiting your consequence.

15. In acquiring new acquaintance, be careful not to neglect your old, for a flight of this kind is eldom forgiven. If you cannot be with your former equaintance so often as you used to be, while you had no others, take care not to give them cause to hink you neglect them; call upon them frequently, hough you cannot stay long with them; tell them on are forry to leave them fo foon, and nothing hould take you away but certain engagements which good-manners oblige you to attend to; for it will be your interest to make all the friends you can, and as lew enemies as possible. By friends, I would not be understood to mean confidential ones; but persons who speak of your respectfully, and who, consistent with their own interest, would wish to be of service to you, and would rather do you good than harm.

16. Another thing I must recommend to you, as characteristic of a polite education, and of having tept good company, is a graceful manner of confer-

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ring favours. The most obliging things may be done fo awkwardly as to offend, while the most disagree able things may be done so agreeable as to please.

17. A few more articles of general advice, and have done; the first is on the subject of vanity. It is the common failing of youth, and as fuch ought to be carefully guarded against. The vanity I mean, is that which, if given way to, ftamps a man a concomb, a character he will find a difficulty to get rid of, perhaps as long as he lives. Now this vanity shews itself in a variety of shapes; one man shall pride himself in taking the lead in all conversations, and peremptorily deciding upon every subject : and ther, defirous of appearing successful among the women, shall infinute the encouragement he has met with, the conquests he makes, and perhaps boast of favours he never received; if he fpeaks truth, heir ungenerous; if false, he is a villain: but whether true or false, he defeats his own purposes, overthrow the reputation he wishes to erect, and draws upon himself contempt in the room of respect. Some men are vain enough to think they acquire confequence by alliance, or by an acquaintance with persons of distinguished character or abilities: hence they are eternally talking of their grand-father, Lord fuch a one ; their kinsman, Sir William such-a-one, or their intimate friend, Dr such-a-one, with whom, perhaps they are scarce acquainted. If they are ever found out (and that they are fure to be, one time or other) they become ridiculous and contemptible: but even admitting what they fay to be true, what then? A man's intrinsic merit does not rife from an enobled alliance, or a reputable acquaintance. A rich man never borrows. When angling for praise, modely is the furest bait. If we would wish to shine in any particular character, we must never affect that character. An affectation of courage will make a mal pals for a bully; an affectation of wit, for a concomb; and an affectation of fense, for a fool. No that I would recommend ballfulness or timidity: not

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no:

I would have every one know his own value, yet not discover that he knows it, but leave his merit to be sound out by others.

18. Another thing worth your attention is, if in company with an inferior, not to let him seel his inferiority; if he discovers it himself without your endeavours, the fault is not yours, and he will not conclude him seel himself inferior to you in abilities, and fortune, or rank, it is an insult that will not readily shall be forgiven. In point of abilities, it would be unjust, as they are out of his power; in point of rank and or fortune, it is ill-natured and ill-bred. This rule the is never more necessary than at table, where there met cannot be a greater insult than to help an inferior to so that any time invite an inferior to your table, you put any time invite an inferior to your table, you put ether any time invite an inferior to your table, you put him, during the time he is there, upon an equality with you, and it is an act of the highest rudeness to treat him, in any respect, slightingly. I would rather double my attention to such a person, and treat him with additional respect, less the should even suphim with additional respect, less the should even supare pose himself neglected. There cannot be a greater shape savageness, or cruelty, or any thing more degrading to a man of fashion, than to put upon, or take unhaps becoming liberties with him, whose modesty, humility, or respect, will not suffer him to retaliate. True politeness consists in making every body happy about even you; and as to mortify is to render unhappy, it can be nothing but the worst of breeding. Make it a rule, sobled make him, if possible, more in love with himself, and desty ou will be certain to gain his esteem; never tell him any thing he may not like to hear, nor say things that will put him out of countenance, but let it be your will put him out of countenance, but let it be your fudy, on all occasions, to please; this will be making friends instead of enemies, and be a mean of ferving yourfelf in the end.

19. Never be witty, at the expence of any one present, nor gratify that idle inclination which is too strong in most young men, I mean, laughing at, or ridiculing the weaknesses, or infirmities of others, by way of diverting the company, or displaying your own superiority. Most people have their weaknesses, their peculiar likings and aversions. Some cannot bear the fight of a cat; others the smell of cheese, and so on; was you to laugh at these men for their antipathies, or by defign or inattention to bring them in their way, you could not infult them more. You may possibly thus gain the laugh on your side, for the present, but it will make the person, perhaps, at whose expence you are merry, your enemy for ever after; and even those who laugh with you, will, on a little reflection, fear you, and probably despile you; whereas to procure what one likes, and to remove what the other hates, would shew them that they were the objects of your attention, and possibly make them more your friends than much greater fervices would have done. If you have wit, use it to please, but not to hurt. You may thine, but take care not to fcorch. In short, never seem to see the faults of others, Though among the mass of men there are, doubtless, numbers of fools and knaves, yet were we to tell eating every one of these we meet with, that we know them gar; to be fuch, we should be in a perpetual war. I would and, detest the knave, and pity the fool, wherever I found then him, but I would let neither of them know unneces-farily that I did so; as I would not be industrious to you p make myself enemies. As one must please others, bred then, in order to be pleased one's-self; consider what is agreeable to you must be agreeable to them, and what conduct yourfelf accordingly.

whom we would not with should hear, are unworth of our considence, or it may lead them to suppose we hock are speaking improperly of them; on both accounts to be the research.

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21. So pulling out one letter after another, and reading them in company, or cutting and paring one's nails, is unpolite and rude. It feems to fay, we are weary of the conversation, and are in want of some amusement to pass away the time.

22. Humming a tune to ourselves, drumming with our fingers on the table, making a noise with our feet, and fuch like, are all breaches of good manners, and indications of our contempt for the persons present;

therefore they should not be indulged.

23. Walking fast in the streets is a mark of vulgarity, implying hurry of business; it may appear well in a mechanic or tradefman, but fuits ill with the character of a gentleman, or a man of fashion.

24. Staring any person you meet, full in the face, is an act also of ill-breeding; it looks as if you faw fomething wonderful in his appearance, and is there-

fore a tacit reprehension.

25. Eating quick, or very flow, at meals, is chanderistic of the vulgar; the first infers poverty, that you have not had a good meal for fome time; the lat, if abroad, that you diflike your entertainment; if at home, that you are rude enough to fet before your friends what you cannot eat yourfelf. So again, eating your foup with your nofe in the plate is vulgar; it has the appearance of being used to hard work, ould and, of course, an unsteady hand. If it be necessary und then to avoid this, it is much more so that of,

26. Smelling to the meat while on the fork, before s to you put it in your mouth. I have feen many an illers, bred fellow do this, and have been so angry, that I what could have kicked him from the table. If you dislike and what you have upon your plate, leave it; but on no account, by smelling to, or examining it, charge your

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account, by fmelling to, or examining it, charge your fill-friend with putting unwholesome provisions before fons you.

27. Spitting on the carpet is a nasty practice, and the we hocking, in a man of liberal education. Was this unts, o become general, it would be as necessary to change he carpets as the table-cloths; besides, it will lead

our acquaintance to suppose, that we have not been used to genteel furniture; for this reason alone, if

for no other, by all means avoid it.

28. Keep yourfelf free likewise from odd tricks or habits fuch as thrusting out your tongue continual. ly, fnaping your fingers, rubbing your hands, figh. ing aloud, an affected thivering of your whole body, gaping with a noise like a country fellow that has been fleeping in a hay-loft, or indeed with any noise; and than many others, which I have noticed before; these are like, imitations of the manners of the mob, and are decout a grading to a gentleman.

Pedantry.

Some learned men, proud of their knowledge, only speak to decide, and give judgment without appeal: the consequences of which is, that mankind, provoked by the infult, and injured by the oppression, revolt; and, in order to shake off the tyranny, even call the lawful authority in question: the more you know, the modester you should be.

Others to thew their learning, or often from the prejudices of a school education, where they hear of nothing elfe, are always talking of the antients as fomething more than men, and of the moderns as fomething less. Speak of the moderns without con-

tempt, and of the ancients without idolatry.

There is another species of learned men, who though less dogmatical and supercilious, are not less impertinent. Thefe are the communicative and this ing pedants, who adorn their conversation, even with women, by happy quotations of Greek and Latin, and who have contracted fuch a familiarity with excess the Greek and Roman authors, that they call them will u by certain names or epithets denoting intimacy. As for it old Homer; that fly old rogue Herace; Maro, in our of flead of Virgit; and Naso instead of Ovid. Their those are often imitated by coxcombs, who have no learn. The ing at all; but who have got fome names, and fome our p

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feraps of ancient authors by heart, which they improperly and impertinently retail in all companies, in hopes of passing for scholars. If therefore you would avoid the accusation of pedantry, on the one hand, or the suspicion of ignorance, on the other, abstain from h. learned oftentation. Speak the language of the comany other. Never feem wifer, nor more learned, than the people you are with: wear your learning like your watch, in a private pocket; and not pull it re out and firike it, merely to thew that you have one. If you are asked what o'clock it is, tell it; but do not proclaim it hourly and unasked, like a watchman.

Pleasure:

Many young people adopt pleasures, for which they have not the least taste, only because they are called by that name. They often mistake so totally, as to imagine that debauchery is pleasure; drunkennels, which is equally destructive to body and mind is certainly a fine pleasure! Gaming, which draws us into a thousand scrapes, leaves us penniless, and gives us the air and manner of outrageous madmen, is another most exquisite pleasure!

Pleasure is the rock which most young people split upon; they launch out with crowded fails in quest of it; but without a compass to direct their course. or reason sufficient to steer the vessel; therefore pain and thame, instead of pleasure, are the returns of the voyage.

We may enjoy the pleasures of the table and wine: La. but stop short of the pains inseparably annexed to an exist excess in either; we may let other people do as they will without formally and sententiously rebuking them As for it; but we must be firmly resolved not to destroy in. our own faculties and constitution, in compliance to those who have no regard to their own.

The more we apply to business, the more we relish our pleasures; the exercise of the mind in the morn.

ing, by study, whets the appetite for the pleasures of the evening, as the exercise of the body, whets the appetite for dinner. Business and pleasure, rightly understood, mutually assist each other; instead of being enemies, as foolish or dull people often think them.

We cannot tafte pleasure truely, unless we can them by previous business; and sew people do busness, who do nothing else: but when we speak of pleasure, we mean the elegant pleasures of a rational being, and not the brutal ones of a swine.

Prejudices.

Never adopt the notions of any books you may read, or of any company you may keep, without examining whether they are just or not; as you will otherwise be hurried away by prejudice, instead of being guided by reason, and quietly cherish error, instead of seeking truth. Use and affert your own reason; reslect, examine, and analize everything in order to form a sound and mature judgment; let no ipse dixit impose upon your understanding, mislead your actions, or dictate your conversation. Consult your reason betimes, it will prove the least erring guide that you can follow: books and conversation may affish it, but adopt neither, blindly nor implicitly: try both by that best rule which God has given to direct us, Reason.

Local prejudices prevail only with the herd of mankind, and do not impose upon cultivated, informed, and reslecting minds: but then there are notions equally salse, though not so glaringly absurd, which are entertained by people of superior and improved understandings, merely for the want of necessary pains to investigate, the proper attention to examine, and the penetration requisite to determine the truth. These are the prejudices which we would have you A

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guard against, by a manly exertion and attention of your reasoning faculty.

Economy.

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A fool squanders away, without credit or advantage to himself, more than a man of sense spends with both: the latter employs his money as he does his time, and never foends a thilling of the one, nor a minute of the other, but in something that is either useful or rationally pleasing to himself or others: the former buys whatever he does not want, he cannot withstand the charms of a toyshop; snuff-boxes, canes, &c. are his destruction. Without care and method, the largest fortune will not supply the extravagant; and with the economist, the smallest will supply all necessary expences. Never from a mistaken economy, buy a thing you do not want, because it is cheap; or from a-filly pride, because it is dear. Keep an exact account of all the money that you receive, and of all that you pay; for few men, who know what they receive, ruin themselves: but many people, particularly those in business, by keeping bad accounts, therefore not knowing the true state of their affairs, have launched out into such extravagancies, as have been the destruction of their families.

Religion.

Errors and mistakes, however gross, in matters of ppinion, if they are fincere, are to be pitied; but not punished nor laughed at. The blindness of the understanding, is as much to be pitied as the blindfary for a man to lose his way in either case; charity bids ersuasions; but charity, at the same time, forbids you as either to punish or ridicule his misfortunes. Every man feeks for truth, but God only knows who has

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found it. It is unjust to perfecute, and absurd to ridicule people for their several opinions, which they cannot help entertaining upon the conviction of their reason. It is he who tells, or acts a lie, that is guilty, and not he who honestly and sincerely believes the lie. The object of all public worship in the world is the same; it is that great Eternal Being who created every thing. The different manners of worship are by no means subjects of ridicule: each seat thinks his own the best; and I know no infallible judge in this world to decide which is best.

The Lord is just and righteous, and will judge the

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earth with equity and truth.

Hath he ekablished his laws in goodness and mercy, and shall be not punish the transgressors thereof?

O think not, bold man, because thy punishments delayed, that the arm of the Lord is weakened; neither flatter thyself with the hope that he winkethat thy doings.

His eye pierceth the fecrets of every heart, and he remembereth them for ever: he respecteth not the

persons or the stations of men.

The high and the low, the rich and the poor, the wife and the ignorant, when the foul hath shaken of the cumbrous shackles of this mortal life, shall equally receive from the sentence of God 2 just and everlasting retribution, according to their works.

Then shall the wicked tremble and be afraid; but the heart of the righteous shall rejoice in his judge.

ments.

O fear the Lord, therefore, all the days of thy life, and walk in the paths which he hath opened

before thee. Let prudence admonish thee, let temperance restrain, let justice guide thy hand, bene-

volence warm thy heart, and gratitude to Heaven

inspire thee with devotion. These shall give the

happiness in thy present state, and bring thee to the

mansions of eternal felicity in the paradife of God.

CHAP. VII.

BIRDS.

Their Variety, Sagacity, Industry, Instinct of Incubation, and particular Care to feed and protect their Young, Sc.

00 numerous are the different kinds of birds, I that it is supposed five hundred different kinds short of the number; fuch great variety is there of those fagacious creatures! We see a surprizng degree of reason in several animals, but it no where appears in a more fensible manner than in he industry of birds in building their nests. In the first place, what master taught them that they have need of fuch habitations? who has taken care to inform them to prepare them in time, and not fuffer hemselves to be prevented by necessity? who has old them how they should build them? what mahematician has given them the figure of them? what architect has taught them to chuse a firm place, end to build upon a folid foundation? what tender nother has advised them to cover the bottom with a soft down or cotton? and when these matters fail, who has luggested to them that ingenious charity, which eads them to pluck off so many feathers from their own breasts with their beaks, as is requisite for the preparing a convenient craddle for their young? What wisdom has pointed out to every distinct kind peculiar manner of building their nefts, fo as to observe the same precautions, though in a thousand different ways? Who has commanded the Swallow, the skilfullest of birds, to draw near to man, and make thoice of his house for the building of his nest, with-In his view, without fear of his knowing it, and feeming tather to invite him to a confideration of his labour?

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neither does he build like other birds with little bit of flicks and flubble, but employs cement and mortar and in fo folid a manner, that it requires fome pain to demolith its work: and yet in all this it makes up of no other instrument but its beak Reduce, if it is possible, the ablest architect to the small bulk of Swallow, and leave him all his knowledge, and only a beak, and see if he will have the same skill and the like success.

Who has made all the birds comprehend that the mult hatch their eggs by fitting upon them? that this necessity was indispensible? that the father and mother could not leave them at the fame time, that if one went abroad to feek for food, the other mul wait till it returns? who has fixed the number of day this painful diligence is to last? who has advised them to affirt the young that are already formed in coming out of the egg, by first breaking the shell and who has so exactly instructed them in the very moment, before which they never come? who has given lesions to all the birds upon the care they ough to take of their young, till fuch time as they are grown up, and in a condition to provide for themselves? Who has made them to diftinguish fuch things as agree well with one species, but are prejudicial to another? and amongst such things as are proper for their parents, and unfit for the young : who has made them to distinguish such as are salutary? We know the tenderness of mothers and the carefulness of nuc fes amongst mankind, but we may question whether it ever came up to what we fee in these little creatures. It is remarkable that birds which feed their young in the nest, who bring but one morfal at a time, and have not fewer, it may be, than feven or eight young in the nest together, which at the return of the dam all gape together, yet she forgets not one of them, but feeds them all; which, unless the did carefully observe and retain in the memory which the fed, and which not, were impossible to be done. To prove still further the segacity of birds, Dr Listar

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ER, and others have observed, that when they have nd fuch a number of eggs as they can conveniently over and hatch, they give over, and begin to fit; or because they are necessarily determined to such a umber; for that they are not is clear, because they for in ability to go on and lay more at pleasure; lens, for example, let but their eggs alone, and the then they have laid fourteen or fifteen will give ver, and begin to bt; whereas if you daily withdraw heir eggs, they will lay five times that number: (yet ome birds are so cunning, that if you leave them but ne egg, they will forfake the nest,) and this is the me in wild as tame domeftic birds. It has been oberred, that by subtracting daily the eggs from a wallow's nest, she proceeded to lay nineteen eggs nd then gave over. An ingenious author has redia tarked, that of the common crow, the female only that that diligently; the male in the mean time very sing her victuals. In most other birds, which has air together, the male and female sit by turns; the male crows are much fatter than the males in the male crows are much fatter than the males in the me of incubation, by reason the male, out of his onjugal affection, almost starves himself, to supply see seemale with plenty. Who has taught several mong the birds that marvellous industry of retaining to od or water in the gullet, without swallowing either made to one or the other, and preserving them for their made to one or the other, and preserving them for their show oung? We may learn an useful lesson from them, nursely the start of the power omit to learn them to sty; for either the young birds dare not trust themselves to the air, crear they are first instructed and brought to it by their tarked, that of the common crow, the female only creathey are first instructed and brought to it by their their arents. And, as Mr Thompson justly observes,

Till down before them fly The parent guides, and chide, exhort, command, Or push them off, the surging air receives The plumy burthen; and their felf-taught wings Winnow the waving element: on ground alighted, Bolder up again they lead, Farther and farther on, the length'ning flight;

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Till vanish'd every fear and every power Rouz'd into life and action, light in air Th' joyful parents see their soaring race.

If man had but as much true love for his offspring as the birds, even the poorest would pinch, to spare every necessary expence for their children to seed, cloath and instruct them in all the duties requisite to

make life happy, and death no terror.

What can be more delightful than a concert of music performed by those fagacious animals! their was the first praise which God received from nature and the first fong of thanksgiving which was offered to him before man was formed. All their founds are different, but all harmonions, and all together compose one choir which men have but forrily imitated One voice however, more strong and melodious, i diffinguished among the reft, and we find upon enquiry from whence it comes, and it is a very small bird; which is the organ of it; this may lead us to consider all the rest of the singing tribe, as they all are small; the great ones being either ignorant of music, or having a disagreeable voice. Thus we every where find that what feems weak and humble has the best destination, and the most gratitude Some of these little birds are extremely beautiful nor can any thing be more rich or variegated than their feathers; but it must be owned that all orms ment must give place to the finery of the Peacock upon which the deity has plentifully bestowed a the riches which fet off the reft, and lavished upon i with gold and azure all the shades of every other colour. This bird feems fensible of its advantage, and looks as if it defigned to difplay all its beauties to our eyes, when it expands that fplendid circumference which fets them all to view. But this most pompou bird of all, has a most disagreeable cry, and is a proof that with a very thinning outfide, there may be bu a forry subfistance within; little gratitude, and a great deal of vanity.

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In examining the feathers of water fowl, fuch as Swans, Ducks, &c. we find one thing very fingular, for they are proof against the water, and continue always dry, and yet our eyes do not discover either the entifice or difference of them; observe the webs of their feet, and they mark their destination, for other birds to whom God has not given the like feathers or feet, are never to rath as to expose themselves to danrer; but who has told the former they run no danger. and who keeps back the latter from following the example! It is not unusual to set duck eggs under a hen, which in this case is deceived by her affection, and takes a foreign broad for her natural offspring; they run to the water as they come out of the shell, nor can their pretended mother prevent them by her repeated calls; the stands upon the brink in astonishment at their rathness, and still more at the fuccess of it: the finds herfelf violently tempted to follow them, and warmly expresses her impatience, but nothing is capable of carrying her to an indifcretion which God has prohibited. Spectators are surpried at it, more or less in proportion to their understandings; the want of which is the cause when such proligies excite so little admiration!

Relative to birds of passage, we shall conclude with observing, that there is amongst every fort of birds a epublic and general rule of government, which guides and restrains every single bird in its duty; before the eneral edict there is none thinks of departing; after to publication, there is none tarries behind; a kind of council fixes the day, and grants a certain time to repare for it; after which they all take their flight, nd fo exact in their discipline, that the next day here is not a traggler or deferter to be found. tany people know no other bird but the swallow hat acts thus : but it is certain that many other fpeies do the same. Ask of the swallows what news e bu bey have received from the countries whither they o in great companies, to be affured that they shall ad all things ready for their reception? We alk

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why do they not keep, like other birds, to the country where they have brought up their young, which have been fo kindly treated in it? By what disposition to travel does this new brood, which knows no other than its native country, conspire at once to quit it! in what language is the ordinance published, which forbids all, both old and new subjects of the republic. to tarry beyond a certain day? and laftly, by what figns do the principal magistrates know that they should run an extreme hazard in exposing themselves to be prevented by a rigorous season? What other answer can be given to these, than that of the prophet, O Lord, how manifold are thy works? In wildom hast thou made them all.' Pfal. ciii, ver. 24.

Delighted with the music of the tuneful tribe, fo let our hearts be prompted to join their melody by more rational notes, and fend up the breath of praile, with the odours of the morning to our common Benefactor. sandangil and salestone viogany had me

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CHAP. VIII. re to sirde st pad ge, me liste constitute wire

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or elat their is among the every light of birds in ANIMALS.

I Ngenious men, who have taken pains to examine the amazing wonders of the creation, affure us that they have found no less than one hundred and fifty entire different kinds of beafts or four-footed ther new executive their differences they care

The most accurate mathematician, the most skilful and in mechanics cannot prescribe a nicer motion than not what they perform, neither can the body be more completely poised for the motion it is to have in every uch creature than it already actually is. From the largest the elephant to the smallest mite, we find the body are she fully ballanced, the head not too heavy nor too light re.

for the rest of the body, nor the body for it. If all the animals of our globe had been made and placed by chance, their organs would probably have been otherwife than they are, and their place and residence confuse and jumbled; but as the matter is now ordered, the globe is equally beforead, fo that no place wanteth proper inhabitants, nor is any creature deftitute of a proper place, and all things necessary to is life, health, and pleasure. As the surface of the terraqueous globe is covered with different soils, with hills and vales, &c. fo all these have their animal inbabitants, whose organs of life and action are manifeftly adapted to fuch and fuch places and things; whose scool and physic, and every other convenience of life, is to be met with at that very place appointed it. The watery, the amphibious, the airy inhabiaile, and, and those on the land, all live and act with Be- pleasure, they are gay, and flourish in their proper element and allotted place, they want neither for food, cloathing, or retreat; which would dwindle and die, destroy or poison one another, if all covetd the fame element, place, or food. The whole urface of our globe can afford room and support ony to fuch a number of all forts of creatures; and if by their doubling, trebling, or any other multiplicaion of their kind, they should increase to double or reble that number, they must starve, or devour one nother; the keeping therefore the ballance even, is amine manifestly a work of Divine wisdom and providence; to use to which end the great Author of life hath determined and sed the life of all creatures to such a length, and their sooted increase to such a number, proportional to their use in the world. The life of some creatures is long, skilful and their increase but small, by that means they do than not overstock the world; and the same benefit is efmore ected, where the increase is great, by the brevity of every uch creatures lives, by their great use, and the frequent occasions there are of them for food to man, or there animals. It is very remarkable, useful creatures to light re produced in great plenty, others in less. But

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there is one to peculiar an animal, as if made fore particular instance in our present case, and that is the Cuntur of Peru, a fowl of that magnitude, strength, and appetite, as to feize not only on the theep, and leffer cattle, but even the larger beafts, yea the ven children too; this bird measures sixteen foot from wing to wing extended; the chief feather in the wine is two foot four inches long; the quill part five in ches and three quarters long, and one inch and a half about in the thickest part : it weighed three dram seventeen grains and a half, and is of a dark brown colour. Nature, to temper and allay their fiercenes, denied them the talons which are given to the Eagles their feet being tipped with claws like a Hen : how ever, their beak is strong enough to tear off the hide cious, and rip up the bowels of an Ox, two of them will hibsing attempt a Cow or a Bull, and devour him; they have affaulted boys of ten years of age, and eaten them Their colour is black and white, like a Magpye; is a given swell there are but few of them; for if there were many, they would very much destroy the cattle: the bod thave on the fore part of the head a comb, in the shat form of a razor: when they alight from the air, they stoet make such a humming noise, with the fluttering of the story of t their wings, as is enough to aftonish or make a man ed of deaf: now these, as they are the most pernicious of To birds, so are they the most rare, being seldom seen shysic or only one, or a sew in large countries; enough to many a keep up the species, but not to overcharge the world of animal the balance of the animal world is throughout ment all ages, kept even; and by a curious harmony, an ame; just proportion between the increase of all animals oreso and the length of their lives, the world is through a terning ages, well, but not over-stored.

It is a great act of power, wisdom, and goodness me, I in the Deity, to provide food for such a number of er, ar animals, as every where possess the terraqueous globe rough that the temperate climates, and rich and plentified, so regions of the earth, should afford subsistence to many animals, may appear less wonderful, perhaps tw, fi

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but that in all other the mode dies is found such a vast number, so great a variety of beasts, birds, sishes, and infects, which is owing to that Being, who hath wisely adapted their bodies to their place, and as well and carefully provided sood for their subsistence there: but what is particu-be semarkable is, that among the great variety of but that in all other the most unlikely places for suplarly remarkable is, that among the great variety of foods, the most useful is the most plentiful, most unirerfal, easiest propagated, and most patient of weather ind other injuries. There is an excellent provision. made relating to the food of animals, that is, various (s mimals delight in various food; fome in grass and terbs, some in grain and seeds; some in stesh, some in infects; fome are more delicate; others are vorade tious, and catch at any thing. If all delighted in, or vill ublisted only with one fort, there would not be bifficient for all: but every variety chusing various ood, and, perhaps, abhorring that which others like;

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ood, and, perhaps, abhorring that which others like; it is a great and wife means that every kind hathing mough, and oftentimes to spare: what is wholesome the bod to one; is nauseous and as posson to another; the that is a sweet and delicate smell and taste to one, the stoetid and loathsome to another; by which means to stoet and loathsome to another; by which means to stoet do so.

To prove the sagacity of animals, the celebrated whysician Galen, relates in his writings an extraordical may and wonderful instance of the self-taught actions or animals: I once (says he) made a great experiment in bringing up a kid without ever seeing its and ame; for diffecting some goats great with young; make a resolve some questions made by anatomists contains the economy of nature in the formation of the young in the womb, and finding a brisk young smels me, I loosed it from the womb after our usual manater of er, and snatching it away before it saw the dam, I loose the time of wine, some of oil, some of honey, the same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk, or other liquor; and others, not a same of milk or other liquor; and others, not a same of milk or other liquor; and others, not a same of milk or other liquor; and others, not a same of milk or other liquor.

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fruits, and there laid it. This young one we far first of all getting upon its feet and walking, as if had heard that its legs were given it for that purpose next shaking off the slime it was beforeared with from the womb; and moreover, thirdly, scratching in fide with one of its feet; then we saw it fmelling of every one of those things that were set in the room and when it had fmelt of them all, it supped up the milk; whereupon we all for admiration cryed out feeing clearly the truth of what Hippocrates faith That the natures and actions of animals are not taught but by inflinct : hereupon I nourished and reared this Kid, and observed it afterwards not only to eat mile but some other things that stood by it : and the time when this Kid was taken out of the womb being a bout fpring time, after fome two months, were brought into it the tender sprouts of shrubs and plants, and it again smelling of all of them, instantly refused fome, but was pleased to taste others; after it had tafted, began to eat of fuch as are the usual food of Goats. Perchance this may feem a fmall thing, but what I now relate is great; for eating the leaves and tender sprouts, it swallowed them down, and then a while after it began to chew the cud; at which, all that faw, cryed out again with admiration, being a stonished at the instinct and natural faculties of animals; for it was no great thing that when the creature was hungry, it should take in the food by the mouth, and chew it with its teeth; but that it should bring-up again into the mouth that which it had swallowed down into its first stomach, and chewing it there a long time, it should grind and smooth it afterwards swallow it again, not into the same stomach, but into another, feemed to us wonderful in deed; but many neglect fuch works of nature, admiring only ftrange and unufual fights.'

What an admirable and curious apparatus is the mouth of all animals, made for the gathering, preparing, and digestion of food! from the very fish entrance, to the utmost exit, we find every thing

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contrived, made, and disposed with the utmost dextejity of art, and curiously adapted to the place the mimal liveth in, and the food it is to be nourished with. We find the mouth is, in every species of animals, nicely conformable to the use of such a part, neatly fized and shaped for the catching of prey, for the gathering or receiving food, for the formation of fpeech, and every other use; in some creatures it is wide, in some little and narrow; in some with a deep incifure up into the head for the better catching and holding of prey, and more easy comminution of hard, large, and troublesome food; in others with a much horter incifure, for the gathering and holding of herbacious food; many more have their mouths strong-In furnished with jaws and teeth, to knaw and scrape out their food, to carry burdens, to perforate the earth, yea the hardest wood, even the stones themselves, for houses for their young. Lastly, in birds it is no less remarkable; for they are neatly shaped for piercing the air, and making way for the body through the airy regions; the bill is hard and horny, which is a good supplement for the want of teeth, and causeth it to have the use and service of the hand: its hooked form is of great use to the rapacious kind, in catching and holding their prey, and in the comminution thereof by tearing; to others it is no less serviceable to their-climbing, as well as neat and nice manner of dividing their food; for instance, Parrots, by the lower jaw being compleatly fitted to the hooks of the upper, they can as minutely break their food, as other animals do with their teeth: the extraordinary length and slendernels of the beak is very uleful to some, to search and grope for their food in moorish places; as its length and breadth is to others, to bunt and fearch in muddy places: and the contrary form, namely, a thick, short, and sharpedged bill, is as useful to other birds, who have occation to hulk and flay the grains they swallow: but it would be endless to reckon up the various shapes, and commodious mechanism of all; the sharpness and strength of those who have occasion to perforate wood and shells; the slenderness and neatness of such as pick up small infects; the cross form of such as pick up sruits, the compressed form of others, with many other curious and artificial forms, all suited to the way of living, and peculiar occasions of the

feveral species of birds.

We shall next take a short view of the teeth of different animals; those which bath teeth on both jaws have but one Romach; but most of those which have no upper teeth, or none at all, have three stomachs. as in beafts, the paunch, the read, and the feck; and in granivorous birds, the crop, the echinus, and the gizard: for as chewing is to an easy digestion, so is swall lowing whole to that which is laborious. Their peeuliar hardness is remarkable, also their firm infertion and bandage in the gums and jaws, and their various shape and strength, suited to the various occasions and use; the foremost weak, and farthest from the centre, as being only preparers to the rest: the others being to grind and mince, are accordingly made stronger, and placed nearer the centre of motion and strength: had the grinders been set in the room of the incifors or fingle teeth, they would have been useless. It is remarkable in what a curious manner the teeth are fitted in the fockets, which being no less accurately done, than what is performed by the most ingenious carpenter in fitting a tenor into a mortice; doth as well infer the art and act of the wife Maker of animal bodies, as the other doth the act and art of man. Next to the mouth, the gullet presenteth itself; in every creature well fized to the food it hath occasion to swallow; in some but narrow, in others as large and extensive; in all exceedingly remarkable for the curious mechanism of the muscles, and the artificial decuffation and position of their fibres. And now we are arrived at the grand receptacle, the stomach! for the most part as various as the food to be conveyed therein; it is observable, that in every species of aniand mar curi

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mais, the strength and fize of their stomach is conformable to their food. Such whose food is more delicate. tender, and nutritive, have commonly this part thinner, weaker, and less bulky; whereas such whose alimentie less nutrative, or whose bodies require larger supplies to answer their bulk, their labours, and waste of strength and spirits, in them it is large and strong; but as remarkable a thing as any in this part of animals is, the curious contrivance and fabric of the ventricles of ruminating creatures: the very act itself of rumination is an excellent provision for the complete maflication of the food, at the leifure times of the animal; but the apparatus for this service, of divers ventriples for its various uses and purposes, together with their curious mechanism, deserves great admiration.

What an aftonishing faculty is that of many animals to discover their prey at vast distances; some by their smelling many miles off; and some by their harp piercing fight aloft in the air, or at other great diffances! What a commodious provision hath the Contriver of nature made for animals, that are necesstated to climb for their food, not only in the structure of their legs and feet, and in the strength of their tendons and muscles, acting in that office; but also in the peculiar Aructure of the principal parts, acting in the acquest of their food. What a provision also is that in nocturnal animals, the peculiar structure of the eyes thus cats (their pupils being erect, and the hutting their eye-lids transverse thereto) can so close their pupil, as to admit of, as it were, only one fingle my of light; and by throwing all open, they can take in all the faintest rays; which is an incomparable provision for these animals, that have occasion to watch and way-lay their prey both by day and night. There is, besides this large opening of the pupil, in lome nocturnal animals, another admirable provition, enabling them to catch their prey in the dark; which a radication or thining of the retina at the bottom of the eye: this is most remarkable in cats, but is not

It deserveth our special notice, that these are in divers animals of divers forms, according to their peculiar occasions: in some animals it is of a longist form; in others (fuch as goats, horfes, sheep, &c.) transverse, with its aperture large; which is a very proper provision for such creatures the better lateral ly, and thereby avoid inconveniences, as well as to help them to gather their food on the ground, both by day and night. In other animals the fiffure of the pupil is erect and also capable of opening wide; and shutting up close; the latter of which serves to exclude the greater light of the day, and the former to take in the more faint rays of the night. Another thing observable in the fight of the eye, is the manner of its fituation in the head, in the forepart, or fide thereof, according to the particular occasions of different animals: in man, and some other creatures, it is placed to look directly forward chiefly: but withal it is so ordered, as to take in near the hemisphere before it; in birds, and some other creatures, the eyes are so feated, as to take in near a whole sphere, that they may the better feek their food, and escape dangers; and, in some creatures, they are seated so as to see their enemy that pursues them, that way, and fo make their escape. Thus in hares and conies their eyes are very protuberant, and placed fo much towards the fides of the head, that their eyes take in nearly 2 whole sphere; whereas, in dogs that pursue them, their eyes are let more forward in the head, to look that way more than backward.

The Scriptures teach us that God's care and wife dom is over all his works, the meanest and most mis-

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ute, as well as the larger ones; thus fnales, not beor able to turn their head quick from fide to fide; heir eyes are not placed in their head, but at the nd of their long horns, which we find they twift and

um about with great eafe and agility.

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Spiders being to live by catching fo nimble a prey safly is, it was necessary they should see her every and take her by a fudden spring, (as they do) without any motion of the head to find her out; which motion would have feared away to timerous ninfect : accordingly, we find that spiders have no ecks, fo that they cannot move their heads; but then hey are furnished some with four, and others with ir, feven, and eight very transparent eyes placed in he front of their heads. In the same manner, there cems to have been the like confideration had to the leasure and benefit of the mole in the structure of seye; for as the habitation of that animal is wholly ubterraneous, and its lodgings, its food, its exercises, ay even all its pastimes and pleasures, in those subteranious recesses and passages which its own industry ath made for itself: so there is an excellent provion made in the fize of the eye of that little creature, canswer all its occasions, and at the same time to revent inconveniences; for as little light will fuffice nanimal living always under ground, the smallest we will abundantly supply that occasion; and as a age protuberant eye, like of other animals, would buch annoy this creature in its principle business of leging for its food and passage, so it is endowed with very small one, commodiously situated in the head, od well fenced and guarded against the annoyaces of the earth; and the same respect we shall and had in the formation of the eye to the particurcircumstances and way of life of every other creaure. heir

It is observed by anatomists, that horses, beasts, heep, and other animals which feed upon grass and erbs, and are therefore obliged to hang down their eads a great deal in chusing and gathering their

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food, have a particular mufcle to fuftain the eye, to prevent its being hurt with too much fufpenfion which is not to be found in man or any other animal who have not occasion to hang down their heads to ner about with creat cafe and perturbed

It is also evident, that there is a very curious and extraordinary formation of the eye bestowed on birth and fishes, different from either man or beast, which enables those creatures to fee at all distances, far of or nigh; which (especially in waters) requireth a diffe ferent conformation of the eye: in birds also this is of great use, to enable them to see their food at their bills end, or to reach the utmost distances their high flights enable them to view; as to fee over great tracts of fea or land, whether they have occasion to fly; or to fee their food or prey, even small fishes in the waters, and birds, worms, &c. on the carth when they fit upon trees, high rocks, or hovering high in the air. Du Hamel tells us of a fingular conformity in the Cormorant's eye, and that is, that the chrystalline is globous, as in fishes, to enable it to fee and purfue its prey under water; which ' I. Fa-BER, in Mr Willoughby, faith they do with amazing fwiftness,' We likewise find that the eyes of birds, beafts, and fishes are defended by a membrane of the nature and hardness of bone or horn: which membrane man has not, he having little occasion to thrust his head into such places of annoyance, as beafts, and other animals; or, if he hath, he can defend his eyes with his hands: but birds, who frequent trees and bushes, quadrupeds and hedges, and long grafs, and who have no part ready, like the hand, to fence of annoyances; these have this incomparable provision made for the fafety of their eyes: and for fishes, as they are destitute of eye-lids because there is no occasion for a defensative against dust and motes, offensive to the eyes of land animals, nor to moisten and wipe the eyes, as the eye-lids do, fo the nictitating membrane is an attendant provifron for all their occasions, without the addition of to the eye-lids: and for creatures, whose eyes, like the rest of their bodies, are tender, and without the guard of bones, their nature hath provided for this necessary and tender sense, a wonderful kind of guard, by enduing the creature with a faculty of withdrawing its head, and lodging them in the same safety

with the body,

Among all the instances we have of natural infind, those instincts, and especial provisions, made o supply the necessities of helpless animals, do, in particular manner, demonstrate the great Creator's are. With what alacrity do the animals transact heir parental ministry! what surprizing care they take to nurse and provide for their young! they think no pains too great to be taken for them, no langers, though ever fo imminent, but they will undertake for their guard and security! how carefully will they lead them about in places of fafety, and carry them into places of retreat and fecurity; yea, some of them will admit them into their own bowels! hey carefs them with their affectionate notes, lull and quiet them with their tender parental voice, put food into their mouths, fuckle them, cherish and tep them warm, teach them to gather food for hemselves; and, in a word, perform the whole part of fo many nurses, deputed by the sovereign Lord and preferver of the world to help fuch young and telpless creatures, till they are come to such an age as to be able to provide for themselves!

What a furprising provision there is made for the refervation of such animals as are sometimes destime of food, or in danger of being fo. The winter s a very inconvenient, improper feafon, to afford other food or exercise to many animals: when the lowery fields are divested of their gaiety: when the ertile trees and plants are stripped of their fruits. and the air, instead of being warmed with the chething beams of the fun, is chilled with rigid frost; what would become of such animals as are impatient cold? what food could be found by fuch as are

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subfifted by the summer fruits? but to obviate this evil, to fave from destruction, and a total extirpation of divers species of animals, the Omnipotent hath wifely ordered the matter. In the first place, he provides for fuch as are impatient of cold, by bestowing upon them such a special structure of body, particular larly of their hearts, and circulation of their blood, a during that feafon, not to fuffer any waste of their bo. dies, and, consequently, not to need any recruits; but that they should be able to live in a kind of sleepy, middle state, in their places of safe retreat, until the warm fun revives both them and their food together. In the next place, he provides for fuch as can bear the cold, but would want food then; by their notable instinct in laying up food beforehand against the approaching winter; of this many entertaining examples may be given; particularly we may, at the proper feason, observe not only little treasures and holes well stocked with timely provisions, but large fields here and there throughout beforead with confiderable numbers of the fruits of the neighbouring trees, laid carefully up in the earth, and covered fafe by the provident little animals inhabiting thereabouts. And not without pleasure, have we seen and admired the fagacity of other animals, hunting out those subterraneous fruits, and pillaging the treasures of thole little creatures.

Another necessary appendage of life, and in which we have plain tokens of the Creator's art, manifested in these two particulars; the suitableness of animals cloathing to their place and occasions; and the garniture and beauty thereof. We find all is curious and complete, nothing too much, nothing too little nor bungling, nothing but what will bear the scrutiny of the most exquisite artists; yea, and so far out do his best skill, that his most exquisite imitations, even of the meanest hair, feather, scale, or shell, will be found only so many ugly, ill-made blunders and blotches, when strictly brought to the test of good glasses.

What care, wisdom, and goodness, the Almighty hewed to his creatures, that they should come into the world with their bodies ready furnished and accommodated, who had neither reason or forecast to contrive, nor parts adapted to the artifices and workmanship. To quadrupeds hair is a commodious cloathing; which, together with the apt texture of their skin, fitteth them for all weathers to lie on the ground, and to do the offices of man; and the thick and warm furs of others are not only a good defenfire against the cold and wet, but also a soft bed to repose themselves in; and to many of them a comfortable covering, to nurse and cherish their young. So feathers are as commodious a drefs to fuch as fly in the air, to birds and fome infects; not only a guard against wet and cold, but a comfortable provision to fuch as hatch and brood their young; but also most commodious for their flight; to which purpose they are nicely and neatly placed, to give them an easy passage through the air, and to assist them in wasting their bodies through that thin medium; for which fervice, how curious is their texture! hollow and thin for lightness, but context and firm for Arength.

Laitly, we shall take a short view of the garniture and beauty of their cloathing; and here we shall thus far, at least, descry it to be beautiful: that, it is complete and workman-like. Even the cloathing of the most fordid animals, those that are the least beautified with colours, or rather whose cloathing may regrate the eye; yet when we come strictly to view them, and seriously consider the nice mechanism of one part, the admirable texture of another, and the exact symmetry of the whole, we discern such strokes of inimitable skill, such incomparable curiosity, that we may say with Solomon, (Eccles. iii. 11.) God hath made every thing beautiful in his

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pleased, as it were on purpose, to give surprising beauties to divers kinds of animals. What radiant colours are many of them, particularly some birds and infects, bedecked with! what a prodigious combination is there often of these, yea, how nice an hair of meaner colours, as to captivate the eye of all beholders, and exceed the dexterity of the most ex.

quifite pencil to copy.

And now, when we thus find a whole world of animals, cloathed in the wifest manner, the most fuitable to the element in which they live, the place in which they refide, and their state and occasions there; when those that are able to shift for them; felves, are left to their own difcretion and diligence. but the helpless well accoutered and provided for: when fuch incomparable strokes of art and workmanthip appear in all, and fuch inimitable glories and beauties in the cloathing of others; who can with the greatest obstinacy and prejudice deny this to be God's handy-work? the gaudy, or even the meanel apparel which man provideth for himself, we readily enough own to be the contrivance of man: and shall we deny the cloathing of all the animal world besides (which infinitely surpasseth all the robes of earthly majesty; shall we, dare we, deny that) to be the work of any thing less than of an infinite, intelligent Being, whose art and power are equal to such glorious works!

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Their Variety and wonderful Structure.

IT/HAT an abundance of fish do the waters pro-VV duce of every fize! when we view these animals we feem to differn nothing befides a head and mil; their very head cannot freely be moved; we hould think them deprived of all that was necessary for the preservation of their lives; but with these few organs, they are more nimble, dexterous, and artificial, than if they had several hands and feet; and the use they make of their tails and fins, carries them along like arrows, and feems to make them fly. As the fish devour one another, how can these watery inhabitants subsist? God has provided for it, by multiplying them in so prodigious a manner, that their fruitfulness infinitely surpasses their mutual desire of eating one another; and what is destroyed is far inferior to their increase: the little ones escape the great by being swifter, and swimming into places where the shallowness of the water will not permit the great fish to follow. And whence comes it, that the fish live in the midst of waters so loaded with falt, that we can scarce bear a drop of them in our mouths, and enjoy there a perfect vigour and health, and how do they preserve in the midst of salt, a flesh that has not the least taste of it? why do the best, and such as are most fit for the use of man, draw near the coasts to offer themselves in a manner to him; whilst agreat many others, which are useless, affect remoteness from him? why do those, who keep themselves in unknown places, whilft they multiply and equire a certain bulk, come in shoals at a particular time to invite the fishermen, and throw themselves in

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a manner into their nets and boats? why do feveral of them, and of the best kinds, enter the mouths of rivers, and run up even to their fprings to communicate the advantages of the fea to fuch countries as he at a distance from it? There are many hundreds of thips every year taking Cod at the bank of Newfound land, who generally carry away above twenty thou. fand Cod each, but though this vast yearly confump. tion has been made for near two hundred years pall, yet the same plenty of them still continues. What hand but thine, O Lord, conducts them to our coaffs for the fervice of ungrateful man: Thy providence is every where to be discerned. The innumerable shells which are spread upon the shore, hide different kinds of fish; that with a very small appearance of life, are fure to open their shells at certain regular times to take in fresh water, and retain therein, by speedily joining them together, the imprudent prey which falls into their fnare. Thus we may observe how innumerable are the proofs of the wisdom of that Being, who spoke, and brought, ten thousand, thousand, rolling worlds, from an immediate state of absolute insensibility.

INSECTS.

Their Policy, Sagacity, Industry, and care of their Eggs and Young.

As none of the insect tribe shew greater marks of policy and industry than the Bee, we shall first endeavour to shew, that amongst the best governed nations in the universe, we have never yet found a government ruled so equitably as that of the Bees. In this republic or monarchy there is no idleness, no avarice or self-love, but all is common; what is necessary is granted to all, a superfluity to none, and it is for the public good that their substance is preserved. New colonies, which would be a burthen to

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the state are fent abroad: they know how to work. and are obliged to do fo, by being dismissed. Their industry is equal to their policy, for instead of contenting themselves with sucking the honey which is better preserved in the cups of flowers than any where elfe, and feeding upon it day by day, they lay up a provision for the whole year, and principally for the winter. The Bee loads the little hooks which adorn its legs with all the wax and gum that it can carry, and in fucking up the honey with the trunk fixed at the extremity of its head, it avoids the daubing of its wings, of which it stands in need to fly from place toplace, and carry it home. If care is not taken to provide a hive for them, they make one in the hollow of some: tree or rock; their first care is to form the comb. which is composed of small equal cells that they may be the better-joined, and leave no interval or space between; then they pour out the honey pure and unmixed into these small reservoirs; and how plentifully soever these magazines are filled, they take no rest till the time of labour and harvest is over. Thus do the Bees in summer provide a sufficiency against the severity of winter: what wonderful wisdom appears in all the actions of these little creatures, what an example for man to guard against the winter of life.

Let us pass from the Bee to the Ant, which resembles it in many respects, except that the Bee enniches man, and the Ant strives all it can to impove-

his him by stealing from him.

This little animal is informed, that the winter is long, and the ripe corn is not a great while exposed in the field; thus the ant never fleeps during harrest: it draws along with the little instruments which are fixed to its head, grains of corn which are thrice is heavy as itself, and goes backward with them as well as is possible: sometimes it finds a friend by is not the way which lends it affistance, but never waits, and for it. The repository (where all is public, and no pre-one thinks of making a separate provision for itself,) ten to is made up of several chambers, which communicate with each other by galleries, which are all dug so deep, that neither the winter rains or snows can penetrate so far as to prejudice their stores. The subterraneous caverus of citadels are inventions by sar more modern and less perfect, and those who have endeavoured to destroy the habitations of such anteras have had leisure to perfect them, have scarce ever succeeded; the branches of them are extended so sar, that they do not feel all the injury that is offered them at first.

When their granaries are full, and the winter comes on, they begin to secure the grain by biting off the two ends of it, and thereby hindring it from growing: thus their first food is no other than a care for futurity, and what they are determined to rather by prudence than necessity. Hence we see what an incomprehensible fund of industry God has placed in this little animal: thus has he given it a kind of prophetic understanding, to oblige us to recur to him, to whom alone it belongs to work such pro-

digies.

Can we sufficiently admire the industry of certain animals, who fpin with fuch art and delicacy, that all appears to be the effect of thought and a mathematical scheme? Who has taught the Spider, an animal, in other respects so contemptible, to form fuch fine threads, so equal and so artfully suspended? who has learnt it to begin with fixing them to certain points, to join them all in one common centre, to draw them first in a right line, and then to strengthen them by circles exactly parallel? who has told it that these threads should be a fnare to catch other animals that have wings, and that it could not come at them but by this stratagem? who has appointed him his place in the centre, where all the lines meet, and where it is necessarily informed by the lightest motion, that fome prey is fallen into its nets? And who has told him that his first care then should be to embarrass the wings of that imprudent prey, by new threads, for fear it should still Silkto be the f

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All the world is a witness of the labours of the Silk-worm: but have the most skilful artists hitherwheen able to imitate them? have they found out the fecret of drawing so fine a thread, so strong, so even, fo bright and uniform? have they any materials of greater value than this thread for making the richest stuffs? do they know how the worm converts the juice of the leaf into golden threads? can they give a reason why a liquid matter, before it has taken air, should grow strong and lengthen itself in infinitum, as foon as it comes into it? can any of them explain how this worm is taught to form itself a retreat under the numberless turnings and windings of the filk, which have flowed from itself, and how in this rich grave it finds a kind of refurrection, which gives it the wings its first birth had resused it.

Every crawling worm becomes a kind of fly, gnat, or butterfly; and first every fly has crawled in its original, and been a kind of worm, caterpillar, or infect, before it had wings; and the middle state between these two extremes of elevation and meanness, is the time when the animal becomes a cod or bean, which is done a great number of ways, but always in a manner uniform to every species.

We shall next make some observations upon a small animal called the Formicalio: it is of an ugly sigure, and looks as if it was but half sinished: it is of a cruel disposition, for it lives only upon the blood of its prey, and its sole occupation is to lay traps for it: its artisce is best seen by having such an animal in one's closet; put it into an earthen vessel full of very sine sand, in which it presently hides itself: when it is there it forms in the sand, the shape of a cone reversed, with an exact and geometrical proportion, and takes up its residence in the point of the cone, which is the centre of it; but still keeping itself covered.

If an ant or fly with its wings taken off, is placed at the entrance of the cone, this little animal, which one would not judge capable of the least effort throws fand forcibly with its head upon the previt has got intelligence of, in order to ftun it and dre it down to the bottom, where it lies concealed; then he comes out from the place of his retreat, and after he has quenched his thirst, throws away the carcale, which might render his cruelty suspected. If one would have the pleasure of seeing him labour a fecond time, it is but filling up the cone by flirring the veffel; and it is surprifing to see with what diligence the little beaft makes a new figure as large and regular as the former. How much reasoning is here required, if this workmanship was founded upon reafon? can a mathematician think more curiously, and be better acquainted with the nature of the cone, of the fand, of the motions, and the conveyances of their found from the centre to every part of the circumierence? it is certain that this beaft must reason, or some one for it; but the wonder is not, either that it should reason, or a foreign principle reason for it, but that this principle should cause all this to be executed by organs which move of themselves, and feem to act only by an inward principle Before we leave this subject, we must not omit mentioning, that this little ugly thing is transformed into a great and beautiful fly; and is no longer of the fame fanguine humour, when it has cast off its first ikin.

Those experienced in observations on the insect part of the creation, by the help of glasses have observed, that stagnated waters appearing green, red, or black, proceeds only from insects of several kinds and colours, nor is the earth, or air itself free from the seeds of life; but this may be better conceived by following the instructions given by Mr BRADLEY, who, by the help of a microscope, has discovered an insect, which, by computation, he found more than a thousand times less than the least dust of sand visible

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the naked eye : it is wonderful to discover the feveral parts of a creature so minute, how small must the organs of its senses be in proportion to its body! the eyes perhaps a thousand times less, and other parts answerable to them: but alas! how trifling an object was the infect we have mentioned, in companion to those discovered by Mr Lewenhorck, in a quantity of pepper water, no bigger than a grain of millet, in which he affirms to have feen ten thoufind living creatures; and some of his friends at the ame time, witness to have seen above thirty thoufind creatures moving in that small quantity of water; nay, they tell us, that because they would be within compass, they only related half the number that they believed they had feen! Now from the greatness of the numbers mentioned, it is inferred. that in a full drop of water, there will be eight millions two hundred and eighty thousand of these animalcula; which, if their fmallness comes to be compared, a grain of fand broken into eight million of parts, would not exceed the smallness of one of these infects.

Mr Hook tells us after he had discovered (by the affistance of good glasses) vast numbers of those animalcula described by Mr Lewenhoek, he made use of other lights and glasses, and magnified them to a very considerable size; and that amongst them he discovered many other forts, much smaller than these he first saw; some of which were so very minute, that millions of millions of them might be contained in one drop of water.

The ingenious Mr RAY tells us of an infect which is hatched and dies in one day, and probably there are many other kinds, which as yet we know nothing of, whose life is of no longer duration: hence we may naturally resect, that as we find by the help of a microscope, that quantity is only computed to be great or small, in proportion to what objects our eyes are capable of seeing without the assistance of glasses; so the idea of time seems confined to our understand-

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ing by the same rule, and the life of that creature which lives only a day, may be of the same term of duration in proportion to itself, as the term of an hundred years is to mankind; that is, three minutes of such an insect's life is equal to a year with us.

The term or duration of life, in different creatures is comparitively long or short according to the num ber, quickness, or flowness of ideas, presenting them felves successively to the mind: for when they succeed one another fwiftly, and many of them are crowded into a narrow compass, the time, however thorti may be, will feem long in proportion to the number of ideas passing through it: on the contrary, when the ideas are but few, and follow one another ren flowly, a long time will appear short, in proportion to their flow fuccession and the smallness of their num ber, From these principles it is manifest, that one day may appear a thousand years, and a thousand years but as one day; by which means the lives of all creatures may, for ought we know, feem to them felves nearly of the same duration. The Ephemeron is an unufual and special instance of the brevity of life in some infects; the life of the faid little creature is about fix hours, in that time it performs all the ne ceffary offices of life: nearly in the beginning of life it sheds its coat; and that being done, and the pool little animal thereby rendered light and agile, it spend the rest of its time in frisking over the waters. The female droppeth her eggs on the waters, and the male his sperm on them, to impregnate them; the eggs are spread about by the waters, descend to the bottom by their own weight, and are hatched by the warmth of the fun into little worms, which make themselves cases in the clay, and feed on the same without any need of paternal care.

Innumerable are the instances of the great care infects take of their young: thus all of them which do not themselves feed their little race, still take care to lay their eggs in such places as are most convenient for their exclusion, and where, when hatched, their

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roper food is ready for them: fo for example, we two forts of Butterflies fastening their eggs to abbage leaves, because they are fit alliment for the Caterpillars that come of them; whereas should they them to the leaves of a plant improper for their food, fuch Caterpillars must needs be lost, they chu. ing rather to die than tafte of fuch plants; for that ind of infect hath a nice and delicate palate, some f them feeding only upon a particular species of lants, others on divers forts, but those of the same nture and quality utterly refusing them of a contravkind; whereas, should they scatter them carelessly nd indifferently in any place, the greatest part of he young would, in all likelihood, perish soon after heir exclusion for want of food; and so their numers continually decreasing, the whole species in a few ears would be in danger of being loft, whereas no land, such thing, we dare fay, hath happened fince the first reation.

So we see, according to the usual course of nature, lambs, Kids, and many other creatures are brought orth in the spring of the year; when tender grass, nd other nutrative plants, are provided for their cod. Instance the Silkworm, whose eggs are hatchwhen the Mulberry-trees begin to bud and put forth heir leaves, whereon these precious insects are to ted; these and many other proofs might be procular regard for the minutest part of the creation:

utas the subjects here to be treated on are numerous,

testall next endeavour to shew many marks of God's

upenduous power in the wonderful properties of anh, air, light, water &c. &c.

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hereid of the distant I ET us take a view of this principal fabric, which is a most stupenduous work; and every particular part thereof doth agrandise the power of the Del ty. Let us ranfack all the globe, and, with the great est accuracy, inspect every part thereof, search out the inmost fecrets of any of the creatures; examine with our most curious gauges, measure by the nicest rules, pry into them with our microscopes, and we shall find that they bear testimony to their Infinite Artist as they far exceed the most exquisite workmanship the ingenious and best astronomers, mathematicians and mechanics the world ever produced. The work of art, when examined by the best glasses, appear rud and bungling pieces; but the closer we inspect into those of the Creator, the more we admire them. the most diligent researches of ingenious men, it a pears that this globe of earth is nearly spherical, which is allowed to be the most commodious figure on man accounts; asit is most capacious, as its surface is equi diffant from the centre, not only of the globe, but least (nearly) of gravity and motion. This figure the most proper in regard of heat, and of light all in some measure; for by this means those two great benefits are uniformly and equally imparted to th world; they come harmoniously and gradually on and go off in the same manner, so that the daily an yearly returns of light and darkness, cold and hea moist and dry, are regular; which they would no be, especially the former, if the mass of earth an waters were, as some imagined them, a large plain;

as others, a great hill in the midst of the ocean; or of a multangular figure. This form of the earth is admirably adapted to the commodious and equal difibution of the waters in the globe; for since by the laws of gravity, the waters will possess the lowest place; therefore, if this mass of earth was cubic, prismatic, or any angular sigure it would follow, that a large part would be drowned, and another be too dry: but being thus orbicular, the waters are here and there as the Divine Providence saw most sit. For a more copious account of the watery element see the

subject on Water.

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The orbicular figure of our globe is far the most teneficial to the winds and motions of the atmofphere: it is not to be doubted, if the earth was of any other form, the current of air would be much retarded, if not wholly stopped. We find by expemence, what influence large and high mountains, bys, capes and headlands have upon the winds; low they stop some, retard many, and divert and change near the shores, even the general and conhant winds that blow round the globe, in the torrid zone: therefore, fince this is the effect of such little excrescences, which have but little proportion to the whole mass, what would be the consequences of much greater angles, that would equal a quarter, tenth, or but a hundred part of the globes radius? entainly these must be such a barricade, as would greatly annoy, or rather absolutely stop the currents of the atmosphere, and thereby deprive the world of those salutiferous gales that keep it sweet and clean. for the fize of this globe we refer the reader to our temarks on Aftronomy.

How amazing it is that this earth rests upon nothing, but is pendent, and hangs in the air, without any visible cause to uphold it from above, or support from beneath; and that it should sly through the regions of air with such velocity, and yet preserve a due and proper distance from that great sountain of light

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What a prodigious number, and how great a van ety of beafts, birds, infects, reptiles, fishes, vegetables, minerals, metals, and fosils, does the earth produce: that there is nothing wanting either for food, physic cloathing, or building! the muniscence of the Creator is so great, that there is amply sufficient to supply the wants, year almost all the extravagancies of all the

creatures upon this terraqueous globe.

The various foils, moulds, and strata or beds of earth, manifest, in a particular manner, the power wisdom, and goodness of God, in making such alto nishing provision for the good of the creation; for as many trees, plants, and grains dwindle and die in a difagreeable foil, yet thrive and flourish in others for instance, different plants delight in the following foils, warm, cold, lax, and fandy, heavy or clayer mixture of both, wet and dry places; still we find provision enough for all these purposes : every coun try abounding with its proper trees and plants, en ry vegetable flourishing and gay, somewhere or other about the globe. To this convenience we may add the great use and benefit the various soils are to dil ferent animals, who make in the earth their place of repose, retreat in winter, security from any ene mies, and nefts for their young : fome delight in lax, previous mould, admitting them an easy passage others delight in a firmer and more folid earth that will better fecure them against injuries from

The various strata or beds, although but little different from the soil or moulds, yet will deserve distinct consideration: we mean those layers of minerals, metals, earth, and stone, lying under that upper stratum or tegument of the earth last spokes of, all of prodigious use to mankind; for building ornament, surnishing us with machines; tools, vel sels, and a multitude of other uses; particularly in physic, exchange, commerce, in manuring and set tilizing our lands, in dying, colouring, and a thous sand other things, too many to be here inserted

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but there is one grand use of these strata, or beds, that cannot eafily be omitted, that is, those subterraneous strata of fand, gravel, and laxer earth that admit of, and facilitate the passage of the sweet waters, may probably be the colanders whereby they are sweetned, and then at the same time also be conwived to all parts of the habitable world, not only through the temperate and torrid zones, but even the farthest regions of the frozen poles. That these firsta are the principal paffages of the sweet fountain of waters, is not to be doubted, confidering that in. them the waters are well known to pals, and where the springs are found; we mean the principal passages, because there are other subterraneous channels, through which many times the waters make their As fubterraneous caverns and volcanos are by some objected against, as being pernicious to community, and looked upon as a fault in the structure of the globe, we shall briefly take notice that they have their uses, being as spiracles or tunnels to the countries where they are; to vent the fires and vapours that would make difmal havock, and oftentimes actually do fo, by dreadful fuccusions and convulfions of the earth; nay, if the hypothesis of a cenhal fire and waters be true, thefe outlets feem to be of the greatest use to the peace and quiet of the teriqueous globe, in venting the fubterraneous heat and vapours; which, if pent up, would make dreadfol and dangerous commotions of the earth and wa-It may be accounted as a special favour of Divine Providence, that there are scarcely any countries, that are much annoyed with earthquakes, that have not one of these fiery vents: and they are confantly all in flames whenever any earthquake happens, they difgorging that fire, which, whilst underneath, was the cause of the disaster. Were it not for these diverticula, whereby it thus gained an exit. ir would rage in the bowels of the earth much more furiously, and make greater havock than it now doth; le that, though these countries, where there are such

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volcanos, are usually more or less troubled with earthquakes; yet, were they wanting, such part would be much more annoyed with them than at present; in all probability to that degree, as to render the earth, for a vast space round, perfectly uninhabitable. So beneficial are volcanos to the territories where they are, that instances are not wanting of some which have been rescued, and wholly delivered from earthquakes by the breaking forth of a new eruption; this continually discharging that matter, which till then had been imprisoned in the bowels of the earth, was the occasion of very great

and frequent calamities.

The last thing we shall take notice of relating to the earth, is the noble, uleful, and necessary appendages of the globe, both mountains and valleys. As to the bufiness of ornament, beauty, and pleasure, we may appeal to all men's fenfes, whether the grateful variety of hills and dales, be not more pleafing than the largest continued plains: let those who make it their business to visit the globe, to divert their fight with the various prospects of the earth; let thefe, I fay, judge whether the far distant parts thereof would be worth vifiting if it was every where of an even level, a globous furface, or one large plain of a thousand miles; and not rather as it now is; whether it be not more pleasing to the eye, to view from the tops of the mountains the subjacent vales and freams, and the far distant hills; and again from the vales to behold the furrounding mountains? The elegant strains and lofty flights, both of the ancient and modern poets on the occasion, are testimonies of the fense of mankind on this configuration of the earth: but be the cause as it will as to beauty, which is the least valuable confideration, we shall find as to convenience, this form is far the most commodious on feveral accounts.

First, As it is the most falubrious, and of the greatest use to the preservation or restoration of the health of man. Some constitutions are indeed of so

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Stein bird the happy a strength, and so confirmed a health, as to be indifferent to almost any place or temperature of the air; but others are so weakly and seeble, as not to be able to bear one; but can live comfortably in another place. As the finer and more subtle air of the hills do best agree with those who are languishing and dying in the seculent and grosser air of great towns, or even of the warmer and more vapourous air, which the valleys contain; so on the contrary, others languish on the hills, and grow lusty and strong in the warmer air of the valleys.

Secondly, To this falutary confirmation of the earth, we may add another great convenience of the hills, and that is, in affording commodious places for habitation; ferving as skreens to keep of the cold, nipping blasts of the northerly and easterly winds: also resecting the benign, cherishing sun beams, so rendering our habitations more comfortable in winter, and promoting the growth of herbs and fruits

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Thirdly, Another benefit of the hills is, that they ferve for the production of a great variety of different species of vegetables, because of the great diversity of soils that are found there, every vertex or eminence almost affording new kinds. Now these plants serve partly for the food and sustenance of such animals as frequent the mountains, partly for medicinal uses; the chief, physic, herbs, and roots, the best in their kinds growing there; it being remarkable, that the greatest and most luxurious species in most genera of plants are natives thereof.

Fourthly, The mountains serve for the harbour, entertainment, and maintenance of various animals, birds, beasts, and insects that breed, feed, and frequent there. The highest tops and pikes of the Aips are not destitute of their inhabitants, the Ibex or Stein Buck among quadrupeds, the Lagopus among birds, the Papilios and store of other insects: 1 2y the highest ridges of them serve for the maintenance

of cattle for the service of the inhabitants of the

valleys.

Fifthly, Those long ridges and chains of losty mountains, which run through whole continents east and west, serve to stop the evagation of the vapours to the north and south in hot countries, condensing them like alembic heads into water, and so, by a kind of external distillation giving the original to springs and rivers: sikewise by amassing, cooling, and constipating, turn them into rain, by those means rendering the servid regions of the torrid zone habitable. The hills serve for the generation of minerals and metals, and in them principally are the most useful fossils sound; or if not so, yet at least all these subterraneous treasures are more easily come at than in the vales.

Sixthly, That it is to the hills that the fountains owe their rife, and the rivers a conveyance, is beyoud dispute; but be the modes, or the method Nature takes in this great work as it will, it is fusficient to our purpose, that the hills are a grand agent in this fo noble and necessary performance: and, configuently, that those vast masses and lofty piles are not (as charged by some) rude and useless excrescerces of our ill-formed globe; but the admirable tools of nature, contrived and ordered by the infinite Creator, to one of its most useful works, and to dilpense this great bleffing to all parts of the earth; without which neither animals could live, nor vegetables fearcely grow, perhaps minerals, metals, or fossils, not receive any increase. For was the surface of the earth even and level, and the middle parts of islands and continents not mountainous and high, as now they are, it is most certain there could be no descent for the rivers, no conveyance for the waters; but instead of gliding along those gentle declivities, which the higher lands now afford them, quietly down to the sea, they would stagnate, and perhaps drown large tracts of land.

Thus having vindicated the present form and fa-

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bric of the earth, as distributed into mountains and valleys, and thereby shewn the usefulness thereof, (which some have found fault with,) we hope we have made it in some measure evident, that God was no idle spectator, nor unconcerned in the ordering of this terraqueous globe, (as some wicked men have inferred) but that there is a great display of the wisdom, power, and goodness of the Eternal, in the formation of this grand beautiful globe of earth; fo excellently contrived for every purpose of the creation, but particularly for the profit, pleafure, and happinels of man. There is fuch harmony throughout the creation, that if we will but purfue the ways of piety and virtue, which God has appointed; if we will form our lives according to the Creator's laws, we may escape many evils in this our frail state, and, by the interpolition of our Mediator, be prepared for a happy exit to the blissful regions of eternity.

Gravity.

The last thing we shall take notice of that is subservient to our globe, is Gravity, or that tendency which all bodies have to the center of the earth; that there is such a thing, is manifest from its effects here upon earth; and that the heavenly bodies attract or gravitate to one another, when placed at due distances, is made highly probable by Sir Isaac Newton. This attractive or gravitating power we take to be congenial to matter, and imprinted on all the matter of the universe, by the Creator's fiat at the creation.

This attraction or gravity, as its force is in a certain proportion, so makes the descent of bodies to be at a certain rate; and was it not for the resistance of the medium, all bodies would descend to the earth with the same velocity; the lightest down as swift as the heaviest mineral; as is manifest in the air-pump, in which the lightest seather, dust, or piece of lead,

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drop down in the same time, from the top to the bottom of a tall exhausted receiver. As a proof of what absolute use this contrivance of gravity is for keeping the feveral globes of the universe from shattering to pieces (as they evidently must do in a little time, by their fwift motion round their own axis, if it was not that all bodies gravitate to their centre most fluids preserve a spherical figure, quicksilver manifeftly doth, especially in small drops or quantities; in which case their own self-attracting power is equal to, or exceeds that of the earth; fo doth lead, and other metals, when properly run into water that is of a due temper, as may be seen in the making of shot; so doth water, oil, and other liquids run into a spherical form when hung on a small surface, as at the point of a pin; or into a hemispherical figure, on a broader furface: their felf-attraction causing the former, as that of the earth, and the surface on which they lie doth the latter. Lattly, to come to the more evident benefit we receive from gravity, pleafe to observe, that all bodies have a natural tendency to the centre of our globe; for whatfoever the decays are among earthly things, however their forms are changed, yet their matter remaineth entire, and returneth again to its grand parent, the earth; fo by this power all its parts are kept in their proper place and order; all material things do naturally gravitate thereto, and unite themselves, and so preferve its bulk entire; the fleeting waters, the most anruly of all its parts, do by this mean keep their constant equipoise in the globe; so that by virtue of this excellent contrivance of the Creator, the observation of the Pfalmist is perpetually fulfilled, (Pfal. lxxxix. v. o.) Thou rulest the raging of the sea; when the waves thereof arise, Thou stillest them.

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A general View of the Vegetable Creation.

growing the fame time to a market of the

elegang the fexeral globes of the orginal from that Was a man introduced into the world at once with all the powers and faculties of his foul in full vigour and perfection, how would he be aftonished in furveying the magnificent seene of things before him! the earth, the air, the fea, the azure vault of heaven, the almost infinite variety of plants and animals, the glorious regent of the day bountifully dispensing the light and heat to all around, the filver queen of night, and all the hoft of heaven passing nightly in review before him! but how would his admiration rife, if he should further be made acquainted with the discoveries of the telescope, microscope, and prism; but as the microscope alone is essential to the subject in question, please to observe, that by the assistance of a good one, we may discover the greatest beauties in the smallest seeds, but particularly the acorn, which displays a forest in miniature: view but the meanest flower of the field, and compare therewith filks of the most exquisite workmanship! how coarse are the latter in comparison! how gross is the workmanship! what a multitude of herbs, trees, fruits, and flowers, does the earth bring forth! how delightfully various in their kinds! so that we are never fatiated with seeing or tasting them; how exquilitely delicious are some! how lovely and beautiful are others! how infinitely useful all! how amazing it is, that the same earth should produce so many kinds, quite different from each other both in shape, colour, and properties! Observe how finely variegated is the tulip! what a fine yellow, and what a most delicate smell has the cowslip! what painter can equal the blushing rose? what perfumer equal it in smell? it no sooner opens, but it has all its freshness and lustre: Has art invented such lively, and at the fame time fuch delicate hues? If we were to examine the wisdom of God in the composition of a

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flower, one could but imagine it was to last for ever; but before the evening it shall fade, the next day wi-

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Next let us consider the general colour wherewith it has pleafed God to beautify every plant: if the fields had been clothed in white or red, who could have borne the splendor or rigour of their dress! if he had blackened them with darker colours, who could have been delighted at fo fad and mournful a spectacle ! an agreeable verdure holds the mean between the two extremes, and bears fueh relation to the structure of the eye, that it refreshes instead of tiring it, and supports and nourishes it, instead of exhausting its force; but what at first we should judge to be one colour, is an aftonishing variety of shades; it is every where green, but no where the fame: no plant is coloured like another; and this furprifing variety, which no art can equal, is further divertified in every plant, which in its first shooting forth, in its growth and maturity, puts on a different verdure: the same may be said of the figure, smell, tafte, and uses of plants, both for nourishment and medicine. We shall make here but one more reflection on this head of the subject : If God had not given us hay, which, when dried, would keep for a long feafon, the power of feeding cattle in the winter would have been impossible; these very dry herbs fuffice likewise to make other animals give milk, and particularly the Cow twice a day, which may supply the place of all other food to a whole family.

Hitherto we have considered the earth as a field or garden of herbs; let us now consider it as a rich orchard abounding with all kinds of fruit, which succeed one another according to the seasons: let us consider one of these trees extending its branches, and bowing down under the weight of excellent fruit, whose colour and smell invite the taste, and in surprising plenty. Such invitations as these we seem to hear from every quarter, and as we advance, we still discover new subject of praise and admiration: here

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the fruit lies concealed within; and there the kernel is covered with a delicate pulp, all fhining without in the most lively colours: this fruit arises from a lower, as almost all fruits do; but that other which is fo delicious is preceded by no flower, but fprings. out of the very rind of the fig-tree; this one begins the fummer, and the other ends it : if the one is not feedily gathered it falls and withers; and if time inot allowed to the other, it will never come to mamity. It is observed, that weak trees, or those of moderate height, bear the most exquisite fruits : the higher they rife, the poorer they appear, and they are lefs agreeable in flavour: from whence we may learn an useful lesson; and the feeble stem of the Vine tells us in its language, that the most wonderful fruits are often the humblest. The other trees which bear only leaves, or fruits that are bitter and very fmall, are notwithstanding very useful: and Providence has made up the defect in fuch a manner, that upon some occasions the barren are to be preferred to the more fruitful, which are hardy of any use, either for building, or navigation, or other indispensible wants : for instance, behold the rees of the forest, how different their green, how pluable the timber; how lofty and majestic is the Cedar, how noble and useful the Oak, whose stuborn nature defies stern winter's furious blasts. lastly, among the trees, we observe some which always preferve their verdure, and in them we may licern a figure of immortality, as the others which wellripped in the winter to be cloathed again in the pring, feem to remind us of the mortality of our odies, and presents to us an image of the resurrecconcern in a large receiver and doubtlels would

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The Properties of AIR. he commued galoing fee a teme, and after

at the betternos es new six editection WHEN we have confidered how necessary air is to our existence, and the many great advantages the creation in general receive from the faid element, we hope such confiderations will vindicate now necessary an explanation of its wonderful properties may be to many, who have not as yet once reflected on the benefit and indispensible necessity there was for air at the creation of this globe; it is this, however common, and little notice taken of that maintains the life, the health, the comfort, the pleasure and business of the whole earth: it is this the whole animal world breatheth and liveth by: not the animals inhabiting the earth, and air, but those of the waters too; and not only animals, but even trees and plants, and the whole vegetable race owe their life to this useful element: without it most animals can scarce live half a minute, and other that are most accustomed to the want of it, cannot live without it many days. That this is fact, is pro wed to ocular demonstration, by a machine called a air-pump, which having a bell glass (called a receiver placed over the top of it, by the working of the pump nearly all the air is drawn or taken away from that part which is under the glass.

The ingenious Mr DERHAM, by repeated experi ments which he made with the air-pump, found that animals whose hearts have two ventricles, and me foramen ovale, as birds, dogs, cats, rats, mice, & die in less than half a minute, counting from the ve ry first exsuction, especially in a small receiver. mole (which he suspected might have borne mor ion than other quadrupeds) died in one minute, without recovery, in a large receiver, and doubtless would hardly have furvived half a minute in a small receiver. A bat (although wounded) fustained the pump two minutes, and revived upon the re-admission of the air; after that he remained four minutes and a half, and revived: laftly, after he had been five minutes, he continued gasping for a time, and after twenty minutes the air was re-admitted, but the bat never revived. As for infects, wasps, bees, hornets, grashoppers and lady-cows, feemed dead in appearance in two minutes, but revived in the open air in two or three hours time, notwithstanding they had been in vacuo twenty-four hours. The ear-wig, the great staphylinus, the great loufy beetle, and some other infects would feem unconcerned at the vaccuim a good while, and lie as dead, but revive in the ir, although fome had lain fixteen hours in the exhausted receiver.

Snails bear the air-pump prodigiously, especially those in shells; two of which lay above twenty-four race, hours, and seemed not much assected: the same mails he left in twenty-eight hours more, after a fecond exhaustion, and found one of them quite dead, but the other revived. Frogs and toads bear the jump long, especially the former: a large toad, annot found in a house, died irrecoverably in less than fix dours: another toad and frog were put in together, and the toad was seemingly dead in two hours, but he frog remained just alive; after they had remaind there eleven hours, and feemingly dead, the frog ecovered in the open air, only weak; but the toad was quite dead: the fame frog being put in again or twenty-feven hours, was then quite dead.

The animalculas in pepper water remained in vano twenty-four hours: and after they had been exposed a day or two in open air, he sound some dead,

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he ve some alive. That the air is the principal cause of the vegetamor ion of plants, is likewise proved by the same en-

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gine. Some lettice feed being sown upon some earth in the open air, and some of the same seed at the same time upon other earth, in the glass receiver of the pneumatic engine, afterwards exhausted of the air: the seed exposed to the air was grown up an inch and a half high in eight days; but that in the exhausted receiver not at all; and air being again admitted into the same emptied receiver, to see who ther any of the seed would then come up, it was found that in the space of one week it was grown up

to the height of two or three inches.

Thus absolutely necessary is the air for the sustained of all things; but it was not only necessary that air should be, but that it should be just of a proper consistence; for had the air been either much thicker or thinner than it is, it would have been a fatal to the whole living world, as the entire want of it: for if thicker we could not have lived is evident from experience; for if we are consined in a close place, the air being rendered thicker therein by the exhalations of our bodies, it soon becomes unsit for use, we pant and grow faint, and if not relieved, should at last die, as has been proved by experiments on many animals.

Mr DERHAM close shut up a Sparrow, so that no fresh air could get in, in less than an hour the bird begun to pant, and be concerned; in half an hour more to be sick, vomit, and more out of breath, and in two hours from his first confinement to be nearly

expiring.

Suppose the air had been thinner, it would not have been so fit for respiration as the common air; as for instance, the learned Joseph Acosta gives a relation of himself and his company, that when they passed the high mountains of Peru, which they called Periocaca, he and his companions were surprised with such extreme pangs of straining and vomiting (not without casting up blood too) and with so violent a distemper, that he concludes he should undoubtedly have died, but that this lasted not above

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free or four hours, before they came into a more natural temperature of air. Many other circumfances might be produced to prove, that the higher you ascend into the atmosphere, the lighter the air It also appears, that it is necessary to life that air should have some weight; as its height reaches about forty-four miles, the whole weight of air that lies on every superficial square foot of earth, is above: two thousand pounds; so that the pressure of the whole atmosphere, on the superficies of the whole earth, is equal to a weight of almost five thousand millions of millions of tons; and the weight of the air pressing on the body of a man of fix foot stature, is equal to twenty-eight thousand pounds. How is it then that we constantly support so enormous a weight? what wonderful power is it that preserves men, beafts, houses, &c. from being crushed to pieces? it was the Omnipotent that balanced this weight of air, by the equilibrium of an internal air, which is placed within all bodies: which, though. it be but small, yet can balance, resist, and equiponderate the intolerable weight of external air: how amazing that that little quantity within our bodies, which we are continually breathing in and out, is able to counter-balance the vast weight of twentyeight thousand pounds! by which means we are rendered quite insensible of so immense a weight, and: move about as if we had no pressure at all upon us; for the foring or force of the internal air, with which our bodies are filled throughout, by being every way equal to that of the external air, and consequently forcing with as great a pressure outwardly, as the external air does to press us together; it naturally follows, that we cannot be fensible of either, because they are both equal; just as two equal weights put prised into the scales, though ever so large, will not have any effect, but add one grain to either, and that will niting link down and the other rife: and this is exactly the so viocase of the external and internal air; for if the presfure of either is taken away, the other acts with a above

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most amazing force. Thus it appears by experiment that if the internal air is extracted from any animal the external will fqueeze the animal flat, and prefs it to death. By a flat empty bottle laid on its fide. it will appear evidently that it is the internal air whether it be stopped or not, that counter-balances the external pressure of the air, and thereby keeps the bottle from being broke; for by applying a fve ringe to the mouth of the bottle, and pumping out that internal air which is in the bottle, no fooner is this fully done, but the pressure of the external air immediately breaks the bottle into a thousand pieces. Thus a globe, or hollow ball of brass, being divided exactly into two equal parts, and the edges made fmooth, will, upon being put together, without any manner of cement, and the air within them being drawn out by means of a cock, the outward air will press them so close together, that it will require? fifteen pound weight for every square inch their cire cumference contains, to pull them asunder: no les powerful is the internal air in bodies; when the external air is taken away, it has been found that it will, by the bare force of its spring, dilate itself into thirteen thousand times the space it possessed under the pressure of the external air, If a strong glass bottle closely sealed up is put under the receiver of an air-pump, the air being drawn out from that part which is covered by the receiver, the air within the bottle will expand itself with so much force, as to break the bottle into a thousand pieces. There have often been instances of men and cattle being killed by lightning, without the least visible mark of damage being done to the body or bodies: this is fupposed to be occasioned by the lightning's rarifying or taking off the pressure of the external air so much, that the air within their bodies expands or dilates itself with such force, as to burst all the blood velfels, &c. whereby immediate death is occasioned, without any outward figns of injury.

We find that wood, steel, and every other elastic

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body that we know of, by being kept long bent or pressed together, lose its spring or elastic force, or at least have it lessened; but the same spring of the air being so absolutely necessary to the world at all times, God has so endued it, that its spring is not lost or lessened, let it remain compressed ever so long.

Mr De Roberval, of the Academy Royal of Sciences, having let his air-gun remain charged with condensed air fixteen years, sound on discharging his gun, that the air's spring or elastic force was not at all abated, but produced the same essect as at sirst. There have been a great number of curious and entertaining experiments made, to prove, even to the eye, this natural or inherent spring of the air; but as the subject on air is a copious one, we shall leave the reader to judge whether what has been advanced on the elasticity of the air be reasonable or not; which he may prove by a variety of simple experiments.

Every property of the air affords fresh matter of allonishment; for though the air is a sufficient body to act fo powerfully, as to expand itself into thirteen thousand times the space; though it is continually ading upon us, and we are on all fides furrounded by it, yet it is flill invisible to our eyes; for had it been visible, how many delightful pleasures should we have been deprived of, and how many inconveniences should we have suffered by it? in vain then had been the ravishing landscapes of hills and vales, groves and fields; in vain would enchanting beauty fit smiling on the human face, had the air been made vible; for we should not then have been able to have discerned objects through it, with any degree of clearness and distinction; but should have seen all the bodies that furround us in a very obscure and confused manner; was the air discernable like other bodies, the vapours would be still more so; the least moke would disfigure the beautiful landscape of nature: life itself would become painful and uneasy; we should see the humours that are perpetually sent

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out by perspiration from the bodies of animals, all the unctuous vapours, all the filth and naftinels that exhales from our kitchens, our streets, and common fewers: fociety would be rendered insupportable, and we should seek for health and safety in our solitudes. flying to woods and deferts to escape the dangers that feem to threaten us, or to get out of the way of those nuisances which would be the inevitable confequences of fuch a fight. Were all the impure, naufeous, unwholesome particles in the air, which we are continually breathing into our lungs, visible to our eyes, in what continual fear should we live of being poisoned by them! but by the air being invifible, we are released from the incessant cares and fears of drawing into the lungs, by the mouth and windpipe, fuch things as would appear quite loathsome for us to do: but nevertheless, lest those exhalations which cease to be offensive and hurtful to us when dispersed, should, by being invisible, infenfibly gather and thicken, fo as to suffocate and injure us, we are forewarned of the danger by the fense of fmelling, and rescued from it by the current of the winds.

There is no less matter for wonder and gratitude, in us, then, though the air is composed of so many millions of particles, exhaled from every thing, that it should acquire no manner of taste, to make our palate in the smallest degree sensible of it! how highly loathsome would it have been, had we, in drawing our breath, tasted the nauseous particles that arise from corrupted bodies, &c.

It is worth our reflection, that though the air is a fluid, or of a liquid nature, and has all the properties of one, yet it cannot, by the most excessive cold; be congealed or frozen like water: was it in any manner capable of this, it would be fatal to every creature on earth: what a manifest instance is it then of design and contrivance, that though it has every other property of a fluid, yet it should be without this one! Besides the many other uses of the air, it

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absolutely necessary to fire and flame; for a candle or live coal will instantly go out under the glass of the air-pump, as foon as ever the air is pumped out. That fire is fed by the air, and that the air's effential matter or vivifying spirit, may be consumed by fire, is evident; because no creature will live, nor a candle burn in air which has paffed through the fire, and may be called burnt air: to this is owing the fad effects which have often happened by burning charcoal in a close room, where there is no chimney; for while fresh air comes freely in, to supply the place of that which has been burnt by the charcoal, no ill effects arise from it; but fire soon consumes the vivifying spirit of the air within the room, so as to render it unfit for life, as has been too often fatally experienced. If the glass of an air-pump is exhausted of the air within it, and the air let in again through a charcoal fire, a candle instantly goes out, if within the glass.

It is owing to the air that we enjoy the light in the manner we do, for was it not that the rays of the fun are reflected back to our eyes from every part, by the particles of the air, the heavens by day would have the appearance of night; the fun indeed, would appear a great light in that part of the dark firmament where it was; but then, whenever we turned our back on it, we should see all night and darkness surrounds us, even at noon tide. That whiteness or lightness which appears to our eyes in the sky all around, in the day time, is owing to the air; and was the air away, it would never be fo: but the air has not only the power of reflecting the mys of the fun, but likewise of refracting them, or turning them out of a direct line, and bending them toward the earth; fo that those rays which would by their course pass directly through the sky, and be of no service to us, are, by this power of the air, turned toward the earth; and it is by this means we enjoy a confiderable degree of light before the fun rifes, and after he fets, which we call twilight,

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this being occasioned by this wonderful property of the air; before the fun rifes or fets, the rays of light darting upward, would pass in a straight line through the atmosphere, and not be discerned by us, and confequently be of no manner of use to us; but being turned out of their direct course by this power of the air, they are bent toward the earth, and brought to our eyes. Was it not for this, the moment the fun fets, we should be in total darkness, and a cloudy night would then present us with the black. est darkness possible; and still more injurious to us would the rifing of the fun be; for if, after the pitchy darkness of the night, the day was to break in fuddenly upon us, in the full strength and power of its brightness, the tender organs of fight would not be able to endure fuch excessive splendor, but be overpowered by the violence of the shock; whereas gradual increase of light, does insensibly strengthen the eyes, and prepare them for the reception of a greater degree of lustre; this twilight inures them to bear the morning fun, and this again fortifies them against the more powerful beams of it, when shining in its full meridian glory: fo great is the benefit we receive from this property of the air, that through its mean we actually see the sun itself, sometimes of the year, taking morning and evening together, ten minutes longer than we should otherwise do: at a medium, it is fix minutes each day throughout the year, which makes three days in one year; fo much longer do we enjoy the fun, than we could otherwife do.

By the gravity of the air it is, that water in refervoirs is forced to enter the conduit pipes, and is thereby carried to any conduit, house, or other place below the horizontal level of the surface of water in the reservoir, or sountain, be the distance what it will. Another effect of the air's gravity, we shall here mention, which is the most important of all, as being the immediate instrument of life; we mean the acts of inspiration and expiration in animals; for in the dila-

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not the thorax, the air, by the pressure of the atmosphere, is forced into the cavity of the lungs, which
we are then said to breathe in, or inspire; but when
the muscles contract, the air is expelled, and we are
then said to breathe it out, or expire it; and this almemate action of the lungs is maintained by the air's
pressure, and is absolutely necessary to life.

It is likewise owing to this property of the air, that infants can receive their food from their mother's breasts; for the child in sucking, drawing away the air from about the orifice of the nipple, the air pressing upon the surface of the breast, forces the milk to spring out plentifully, as there is nothing there to resist it, the continual suction of the child taking away the pressure of the air from off that part: that this is the case, is plain, otherwise the sucking of the child could never make the milk to come: and it is the same with all other creatures that do suck.

Many other benefits do we receive from the air, such as the winds, which are so necessary for sailing to different parts of the globe.

To those who were not before acquainted with the surprising properties of air, have we opened a scene of amazing knowledge of the wonderful things of nature, the prospect of which was laid open to us for the noblest purposes, to make us better men, and will our hearts with the most exalted sentiments of live and gratitude towards him who is the giver of all good things.

Light.

There is still another appendage of our habitation, which is no less common, no less heeded, and yet no less useful than the air itself, and that is light; for what benefit would life be of, what pleasure, what comfort would it be for us to live in perpetual darkness? how could we provide ourselves with food

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and necessaries? how could we go about the least business, correspond one with another, or be of any use in the world, or any creatures be the same to us without light, and those admirable organs of the body, which the great Creator hath adapted to the perception of that great benefit? but now, by the help of this admirable, this first made (because most necessary) creature of God; by this we find, all the animal world is enabled to go as their occasions call; they can with admiration and pleasure behold the glorious works of God; they can view the glories of the heavens, and fee the beauties of the flowers fields, the gay attire of the feathered tribe, the exquisite garniture of many quadrupeds, insects, and other creatures; they can take in the delightful landscapes of divers countries and places; and behold the harmony of this lower world, and of all the globes above. Men, whose business and occasions oftentimes necessitate them to borrow a part of the night, and all other animals, particularly fuch whole fafety, temper, or constitution of parts (as of their eyes for instance,) confine them to their dens and places of retirement and rest by day, and are therefore in course compelled to seek their food, and wander about on their most necessary occasions of life by night: all these would at once be cut off from one of the grand benefits of life, from acting that part they bear in the creation, during fuch time as they should be put into absolute darkness. It may feem that light is a necessary consequence of the sun, of any other luminous body, and that there needed only thefe to give light to the world; but as the same allfreing and unerring wildom was as necessary to endue it with just fuch properties as would render it of use to us, as there was to form the air of just such a proper confistence, as rendered it fit for our breathing in, and no other; in vain might the fun have emitted light had not the wisdom of God disposed it to pass or fly with a most amazing and inconceivable fwiftness: had not this been so ordered, the iun being placed in the heavens would have been but of little fervice to us, his rifing every day would have cherished us very little, either with its light or heat; for was the motion thereof no fwifter than the moion of the swiftest bodies on earth, such as a bullet out of a great gun, (which flies a mile in about eight feconds and a half of time) or of found, which flies a mile in about four seconds and a half, light would take. ip in its progress from the fun to us, thirty-two years, at the rate of the latter motion; fo that in this cafe. its rigour would be greatly cooled and abated; its rays would be less penetrating, and darkness would be with great difficulty diffipated : but light passing with the prodigious swiftness of almost two hundred thousand English miles in one second of time, or being but about feven or eight minutes of an hour in coming from the fun to us, which is above eighty-fix millions of miles, therefore we receive the kindly effects and infuences of that noble and useful instrument of our advantage, undiminished by its long passage. How amazing is this wonderful swiftness! we esteem a bill thet out of the mouth of a cannon to fly with prodigious celerity, but light flies a million of times fwifter; and it not only flies thus amazingly fwift, but it reaches to an inconceivable distance, even to the farthest bounds of the universe; which is so vast, that rexceeds the comprehension of man's understanding: but that it is of this extent is manifest, from our feeing some of the farthest distant objects, the heavenly bodies, some with our naked eye, some with the help of glaffes, and others in all probability farther still, with better glaffes.

Now as light is of the greatest use to enable us to see objects at all, so the extention thereof is no less useful to enable us to see afar off; by which mean we are afforded a sight of many illustrious orbs visible in the heavens, and can improve them to some of the noblest sciences, such as navigation and astronomy; but there was still further wisdom employed in the formation of light; for as it was necessary it

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should pass with such a prodigious swiftness, had not its particles been formed extremely small, it would have beaten in pieces all folid bodies; for we know that the force with which any thing acts, is increased in proportion to the swiftness with which it moves. Thus a bullet, that perhaps does not weigh much above an ounce, will, by the swiftness it moves with when shot out of a musket, pierce through, and beat in pieces, exceeding ftrong and folid bodies, which it would have no effect upon, was it to be flung against them with the hand only: and it is certain, that with the swiftness with which light flies, a particle of it weighing but the eighteenth part of a grain only, would act with as great force upon any body, as a ball of twelve pounds weight shot out of a cannon, Thus we find that it was necessary that light should fly with prodigious swiftness, otherwise its influence would have been of little or no benefit to us: it was necessary that its particles should be most exceedingly fmall, otherwise it would have broke almost every thing in pieces: it was necessary that its rays in its passage should continually separate and divide from each other, otherwise it would have set the whole earth on fire. Light has likewise two other properties, that are of the greatest service to us; which are, that its rays are capable of being refracted or turned out of their course in passing from one medium into another, as from air into water, or glass and great part of it is likewise reflected back from almost all bodies. Let us then look upon it as a cause whose Author is All-wise, All-powerful, and who dwells in light inaccassible in the heavens.

Sound.

The vast swiftness with which found flies, is like wife worth observing and admiring, being fifty-two those times greater than that of a brisk wind, or current of ing air; it is by this property rendered of a much great the a

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er use to us, than if its motion had been flower. Sound, by repeated experiments that have been made, is known to fly no less than one thousand one hundred and forty-two feet in one fecond of time, or the fixtieth part of a minute; and whether the found be loud or languid, whether of bells, guns, &c. great or fmall, or any other fonorous body, it flies with the same incredible swiftness; nor does it lessen the farther it goes, but paffes over the last mile as quick is it did the first; neither does the difference of day or night, fummer or winter, heat or cold make any difference in the swiftness of its progress: in all these changes it keeps on its course, without being quickmed or retarded by any of them; even flying against the wind it moves with nearly the fame fwiftness, but more or less loud as the wind is with or against it. Upon many occasions we have need to call people to our immediate affiftance who are at a diffance; ingly was then the motion of found flow, we should perish before they would know that we wanted help: thus in the accidents of fire the whole country around, by the ringing of a bell, is informed of it in much less vhole
operthan a minute, and immediately hasten to the assistince of the distressed; but if found, instead of flying which imile in four fecends of time, was to be four hours and of ingoing that distance, a town might be burnt down medibefore sufficient help could be called for. Thus in the time of war, how necessary is the quick motion from a so an enemy, and which gate or part they attack, that hey may all hasten to the defence of that spot. What loss of time would have arisen had the motion of found been flow, in calling any part of a family, what time would be lost in waiting for an answer: and the difficulty would have been as great in many cafes. like

Sound is conveyed in circles of the air, just like y-two hose we see made in the water upon striking or throw-ent of ing any thing into it, one circle after another, till great the agitation of the water is subfided: now, though

they both act in the same manner, yet the circles of the air are formed eight hundred and fixty-five times

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quicker than those of the water.

The distances found will reach to is no less wonderful than its swiftness: a Gentleman of great veracity, who lived fome years at Gibraltar, affirms, that he has at Old Gibraltar, heard the watch-word of the night (viz. " all's well") given by the centinel to the patroll on the ramparts of New Gibraltar, in a ftill ferene night, and that as plain and diftinct he thought, as he thould have done had he been on the rampart himself: the bay between the two places he judged to be about ten English miles and an half, Many other instances there are to prove at what a vast distance sound may be heard, but what has been explained, it is hoped, will give fatisfaction to every impartial reader.

CHAP.

WATER.

ET us next consider the element of water, which we shall find no less fitly, and wonderfully disposed for our service; what immense advantages arise to us from water carriages? how easily by this means we may transport vast weights and quantities of goods from one part to another, even to the greatest distance, which we could by no means do without the help of water; that by its mean a speedy and easy communication is made of all parts of the world with one another; that it not only supports a prodigious weight, but keeps it suspended in so exact

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m equilibrium, that a very small force is sussicient to determine its motion one way or other as we please; so that two or three men, with oars, horses, or wind, may convey forty or fifty tons by water from place to place, which by land would require near two hundred horses, forty carts, and as many men. By water's being of the confishency it is, we can make use of mills for various purposes, which are out in motion by this element; but had it been of a hehter nature, and its force not increased by motion, our water mills would have been useless; and had it been of a thicker confistence than it is, it would have been no less unfit for our use; for then it would have stood still or stagnated, instead of runming, as it now does, every where to communicate its bleffings to all parts; it would not have penetrated into the roots and fibres of trees and plants. to give them their nourishment; neither would it have been of that infinite service, as it now is to all creatures, in fatisfying their thirst, and diluting the food they eat, so as to make it the fitter for nourish-There are two other properties of water: which, though not fo obvious, are the means of making it of greater use to us, viz. its easiness to be turned any way, or brought into any compass or hape that we please; by this mean, if we have occasion to water our meadows, we need only cut a few trenches from the river, and we can by that mean conduct it to every part; if we have occasion to bring it into our houses, it without difficulty enters into any pipes we lay for its conveyance; if we want to bring it into a smaller compass, it obeys our defires, it waits but the pleasure of man to change its former course, and to enter into whatever channel he thinks fit to prepare for it.

Another property of water is, that it will always nile again to the same height that it falls from: had this property only been wanting in water, how much would it have lessened the blessings? all our rivers, brooks, and pleasant running streams, must have

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stopped at the first rising they came to, and all the benefit of rivers and other streams would have been entirely loft to the greatest part of the earth : but the wife Creator endued water with this property of n. fing as high as it falls from, and then placed the four ces, or fprings of rivers and brooks, in hills and mountains; by which mean they acquire a fufficient force to run through whole countries, notwithstand ing the inequality of the earth's furface, and the is fings which they meet with in their course. Had the waters been left to stagnate in pits, they would have bred fuch damps, as would have rendered it too unwholfome for us to live any where near them; and had they not been distributed in almost every place. it would have been no less injurious to us, for exceffive droughts is as fatal as damps and fogs: whereas it is certain that every little rivulet refreshes and purifies the air of all the adjacent places with its gentle exhalations, and cleanfes the earth of all filth and naftiness: the fruitfulness of lands is likewise generally owing to the neighbourhood of rivers: how vast the difference betwixt a country that is watered by a river, and one that is destitute of that convenience! the latter is barren and dreary, whilst the other is almost a paradife; for it is not only the trees and meadows which lie just upon the banks of it, that a river makes this great alteration, but upon the whole country round for several leagues; for it is certain that the fruits of the earth receive their nourishment as well from their leaves as roots, insomuch, that oftentimes when the earth is almost exhausted of its humidity, having scarce any left wherewith to feed the roots, the dew alone which falls upon the leaves in the night-time, being fucked in and distributed through the whole plant, does supply it with moisture. It is the brooks and rivers that are the principal magazines that supply this necessary expence of moisture, which exhaing from them in mists, are carried by the wind to fall down again in refreshing dews, not only upon those places which the

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border upon the rivers, but also on such as are fever leagues distant from them. Thus do all parts of nture mutually help and affift each other, declaring hemselves, in the wonderful variety of their operaions, to be all the handy-work of the faine Author and Artificer; as they do undeniably demonstrate his kind and providential regard to our happiness and velfare. And as this element is of fuch infinite ferice to us for various uses, what an instance of goodsels and defign is it, that it is dispersed throughout he whole earth! what a vast length are many rivers. iz. the Rhine is above fix hundred miles; the Dajube fifteen hundred; and the Niger, waters three housand three hundred miles of land, in the vast, burning, fandy defarts of Africa; the river of Amauns in America, runs three thousand miles, and discharges itself into the ocean by an outlet, two hundred and fifty-two miles in breadth; besides there me many others of equal length, and fome which are supposed to run the vast course of fix thousand miles; when we consider this, our reason tells us, that nothing but the omnipotent hand of God could ferm and hollow fuch channels from one end of the The whole distribution of the earth to the other. waters, and the dry land, although it may feem rude and undefigned to a careless observer, yet is admiably adapted to the uses and conveniences of our world. For in the first place, the distribution is so well made, the earth and waters fo handsomely, so workman-like laid, every where all the world over, hat there is a just equipoise of the whole globe: the Northern balanceth the Southern ocean, the Atlanto the Pacific fea: the American dry land is a counespoise to the European, Asiatic, and African dry land.

In the next place, the earth and waters are so admirably well placed about in the globe, as to be help-fill to one another's uses: the great oceans, and the letter seas and lakes, are so admirably well distributed broughout the globe, as to afford sufficient vapours

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for clouds and rain, to temperate the cold of the northern frozen air, to cool and mitigate the heats of the torrid zone, and to refresh the air with fertile showers; nay, so abundant is the great bleffing which the indulgent Creator hath offered us, by the means of this diffribution of the waters, that there is more than a scancy bare provision, or mere sufficiency; e. ven a plenty, a surplusage of this useful creature of God (the fresh waters) afforded to the world, and they are so well ordered, as not to drown the nations of the earth, nor to stagnate, stink, and poison, or annoy them; but to be gently carried through convenient channels to that vast immense receptacle of waters, the fea, which is in itself so aftonishing a wonder, that it confounds the imagination. has prepared for the water fo capacious a bed? who but the almighty God?

Clouds, Rain, Hail, and Snow.

First of Clouds and Rain.

The clouds and rain are of the utmost service to us, as is manifest in the refreshing pleasant shades which the clouds afford, and the fertile dews and showers which they pour down on the trees and plants, which would languish and die with perpetual drought, but are hereby made verdant and slourishing, gay and ornamental: clouds and rain are made of vapours raised from water or moisture only; these vapours are demonstratively no other than small bubbles or bladders detached from the waters by the powers of the sun, or the subterraneous heat, or both;

and, being lighter than the atmosphere, are buoyed up thereby, until they become of an equal weight therewith, in some of its regions aloft in the air, or nearer the earth; in which these vapours are formed into clouds, rain, hail, fnow, lightning, dew, mifts, and other meteors. In this formation of meteors, the grand agent is cold; which commonly, if not always, occupies the superior regions of the air, as is manifest from those mountains which exalt their lefty tops into the upper and middle regions, and are always covered with fnow or ice: this cold, if it approaches near the earth, presently precipitates the vapours, either into dews, or if the vapours more copiously ascend, and soon meet the cold, they are then condensed into misling, or else into showers of small rain, falling in numerous, thick, small drops: but if these vapours are not only copious, but also as heavy as our lower air itself (by which mean their bladders are thick and fuller of water) in this case they become visible, swim but a little height above the earth, and make what we call a mist or fog. But if they are a degree lighter, so as to mount higher, but not to any great height, as also meet not with cold enough to condense them, nor wind enough to disspate them, they then form an heavy, thick, dark ky, lasting oftentimes for several weeks, without either fun or rain, and in this case it is scarce ever known to rain, till it hath been first fair, and then foul.

From what hath been faid, the case is easily accounted for, viz. whilst the vapours remain in the same state, the weather doth so too; and such weather is generally attended with moderate warmth, and with little or no wind to disturb the vapours, and an heavy atmosphere to support them, the barometer being commonly high then: but when the cold approacheth, and by condensing drives the vapours into clouds or drops, then is way made for the sun beams, till the same vapours, being by surther condensation formed into rain, and fall down in

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drops. The cold's approaching the vapours, and confequently the alteration of such dark weather, is often before hand perceived, by some sew small drops of rain, hail, or snow, now and then falling before any alteration hath been in the weather; which probably is from the cold meeting some of the straggling vapours, or the uppermost of them, and condensing them into drops, before it arrives unto, and exerts itself upon the main body of vapours below.

It appears, then that the clouds are a vast hear of vapours exhaled from fea and land, and raifed to that height in the air, where they become of e. qual weight or gravity with the air; in those parts therefore they float and fwim, and by firiking one against the other, and mixing one with another, they coalefce, or thicken, and become more denle and weighty. The thinner or rarer the clouds are, the lighter and higher they foar; but the more dense they are, the weightier, and the nearer they ride to the earth. The clouds are from about a quarter of a mile to a mile high. The wonderful variety in the colour of clouds, is owing to their particular fituation to the fun, and the different reflections of his light; the various figure of the clouds refults from their loofe and voluble texture, revolving into any form, according to the different force of the winds. When various heaps of clouds are driven together by the agitation of the winds, they mix and run into one body, and thus diffolve and condense each other into their former substance of water; also the coldness of the air is the greatest mean to collect, compact, and condense clouds into water.

The manner how vapours are precipitated by the cold, or reduced into drops, is conceived to be thus: Vapours being, as we have faid, no other than inflated bladders of water: when they meet with a colder air than what is contained in them, the contained air is reduced into a lefs space, and the watery shell or case rendered thicker, by that mean so as to become heavier than the air, by which they are buoyed up,

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and confequently must needs fall down : - also many of those thickned bladders run into one, and so form drops greater or smaller, according to the quantity of vapours collected together. As to the rain of different places, we have in some of our Philosophical Transactions, the quantity assigned, particularly in No. 321 we have these, viz. The depth of the rain mone year with another, in English measure, if it was to stagnate on the earth, would amount unto, at Townly in Lancashire, forty-two inches and a half; at Upminster in Essex, nineteen inches and a quarter; at Zurich in Switzerland, thirty-two inches and a quarter; at Pifa in Italy, forty-three inches and a quarter; at Paris in France, nineteen inches; and at Lifle in Flanders, twenty-four inches.

Hail.

Hail is thus generated: When the cloud which raineth is very high in the air, or when all the regions of the air are very cold, the falling drops of water are congealed thereby, and grow into a glacy subfance, somewhat white and hard, of different size and figure according to the particles of water, the degrees of heat and cold, and the wind, &c.

Snow.

Snow is produced thus: When the vapours are beome confiderably condensed, yet not so far as to beome liquified, or dissolved into water, then by a special degree of coldness in the upper air, the particles
of the condensed vapours are compelled into a hard,
rigid, and glacy substance, several of which adhering
together, form little sleeces of a white substance,
somewhat heavier than the air, and therefore descend
in a flow gentle manner.

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The Gauses of Ice, Thunder, Lightning, the Aurora Borealis, Ignis Fatuus, and the Rainbow.

First, Ice and freezing are supposed to be the effects of nitrous particles, which, being sharp and pointed, infinuate themselves into the pores of water, dew, &c. and thereby fix, chrystalize, and harden the superficies thereof into those substances which we call ice, &c.

Secondly, Thunder proceeds from an heterogeneous commixture of the effluvia or exhalations of fulphurous, nitrous, and inflammable bodies in the air, which ferment, kindle into flames, and make horrible explosions (like gunpowder) which we call thunder

and lightning.

Thirdly, The Aurora Borealis, or northern lights, are produced also from nitro-sulphurous vapours, which are thinly spread through the atmosphere higher than the clouds, and by sermentation take fire, and the explosion of one portion kindling the next, the slashes succeed one another, till all the vapours within their reach are set on fire; the streams whereof will appear to converge toward the zenith of the spectator, or the point over his head.

Fourthly, The Ignis Fatuus, or Jack-with-a-lanthom, is supposed to be nothing else but a fat unctuous and sulphurous vapour, which appears lucid, and is wasted about by the air, near the earth's surface, like a light in a lanthorn: such like vapours kindling in the serene air in the night, appear like falling stars, and

are therefore so called.

Lastly, The Rainbow, one of the finest phænomena of nature, exists in falling rain or dew, and is produced by reslection and refraction of the sun's rays in the aqueous particles: the manner whereof, and the wonderful properties of the bow, too large and many

to be here explained, may be feen in Mr MARTIN's

Philosophical Grammar.

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And now let us pause a little and reflect:——and upon the whole matter, what less can be concluded, than that there is a Being infinitely wise, potent, and kind, who is able to contrive and make this glorious seene of things?

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NATIONS compared with each other, &c.

The first difference, in comparing a barbarous with a polite nation, that visibly offers, is the longevity of the inhabitants of polished countries, above the savage tenants of the forest. A life of seventy, eighty, and even an hundred years, is very common in several parts of Europe, where the inhabitants are reduced into fixed society: but through all the wilds of Tartary, nay, if we extend the view to the northern parts of America, that life is thought long which reaches threescore.

The viciflitudes of season, the long fastings, the consequent repletion upon finding the precarious meal, swimming rivers, while warm with the chase, and long protracted vigils, all contribute to shorten the luman span, and no habitude can reconcile them to the natures. From hence we see how very wrong those parents are, who attempt to improve the health and strength of their children by too hard an education; and though some may survive such attempts, they seem insensible how many die under the experi-

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ment. Peter the Great, in order to teach some children to be perfect sailors, instituted, that they should be permitted to drink only sea-water; their instructors obeyed the order, but all the children died.

There are fill however some physical causes which contribute to keep the inhabitants of those extensive regions barbarous; and among the reft may be reck. oned the want of corn. In those countries, which lie even in a more southern latitude than England, the inhabitants find that they are incapable of producing corn. To what shall we attribute this furprising defect? Not to the foil, for that it is at once deep and fertile, nor to the coldness of the climate, for colder climates in Europe produce corn in abundance: To their immense forests alone can this defect of vegetation be ascribed. Every tree has its own humid atmosphere around it, insomuch, that farmers generally find their neighbourhood noxious to fields of corn; a forest of trees, by loading the atmosphere with too much humidity, is still more hurtful. If we examine the foil upon which forests stand, we shall in general find it cold, moift, and covered with water; in fuch therefore it cannot be expected corn should be produced in any quantities; and even though the forests should be cleared away, yet this cannot be done to fuch a fufficient extent as to prevent the humidity of the wide extended neighbouring forest, to injure every labour of the husbandman.

Thus we see every country capable only of a gradual improvement, as well with regard to its natural qualities, as to the moral character of its inhabitants. The soil must be cleared, not in spots, but in tracts, the most extensive, before it acquires any degree of fertility; the inhabitants must become numerous be-

fore they grow polite.

Attempting to introduce polite manners into a barbarous and ill-peopled country, is as vain an endeavour, as by clearing a way in the midst of a forest, to attempt to produce corn. Politeness may be introduced into any country too soon; and in

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Their great monarch Peter erroneously fancied. that by fending the inhabitants of a polified country, h people those regions, he would improve the orifinal inhabitants in the duties of fociety; time however, has thewn, that those unhappy gentlemen who were banished to this region of defolate sterility, were incapable of introducing happiness among thenatives; with all their arts and knowledge, were even more helpless than the meanest of them: Nature, that true benefactor of mankind, quickly evinced, that favage cultoms were the most fit for hvage inhabitants. The polite Europeans, with all their refined defires of education, and liable to all those wants which arise from connected society, found themselves among a people, whose only wish was to live, who placed more happiness in the greatness than delicacy of a meal, who were unaccusfomed to these fictitious wants, which arise when our real necessities are supplied; who were insensible how those, who wanted no sensual enjoyment, could fill be unhappy: What then could missionaries do in fuch a country? They were, instead of refining the inhabitants, obliged to comply with their barbahous manners; and instead of bringing over the country from barbarism, they became themselves barbarians.

Peter should have behaved as the Portuguese did, in similar circumstances, to the polite Chinese, already instructed in the luxuries of life. They sent missionaries, who were capable of improving them in speculative knowledge, and the sciences, and such messengers were gladly received: To the wild Americans, they, on the contrary, sent men who had less learning, and more perseverance, men who were capable of instructing the inhabitants how to cultivate the earth, and to improve the productions of nature.

Let us then here pause, to consider the wisdom

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of man in fuiting himself to the chimate, the soil, the fociety in which he has been born. Those peculiarities, which we are too apt to call barbarous, because they differ from our own, are often the effect of fine contrivance and well-guided fagacity. Should we, for instance, condemn the clumfy shoe of an inhabitant of the north, how justly might he laugh at our ignorance, fince they prevent him from finking in the deep fnows, with which the country is generally covered? Should we call the Tartar barbarous, because he eats his horse, would he not justly deride our delicacy, fince the flesh of animals, as they approach the north, is in general more tender than that of fouthern animals; and horse fielh in Tartary is probably the greatest delicacy they have? Should we object to his fondness for dutilled milk, who knows but this may be a delicacy yet untafted in Europe, as the preparation is certainly a chymical fecret unknown to the politest European, who are incapable of extracting a spirit from milk? Should we condemn them for keeping the bodies of their dead longer than we; they may justly answer, that with them, bodies are found not to corrupt fo foon as with us; and as no inconvenience attends this custom, it is but an innocent mark of respect to the dead. If their language be defective and barren, they have but few ideas, and consequently do not want a language more copious. They want an exalted understanding; and happy it is for them that they labour under this defect. The greatest understanding of an individual, doomed to procure food and cloathing for himself, can but barely supply him expedients to prolong his existence from day to day. But should we suppose him one of a large community, performing only his share of the common business, he then gains leifure for intellectual pleasures, and enjoys the happiness of reason and reflection.

Proceeding in our intellectual map, we now defeend lower, to those happy climates possessed by the polite inhabitants of the temperate zone, where

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the foil hath been fertilized by long culture, where the river glides in a channel not its own, where a nature feems to put on the face of art, where the brute animals are in perfect subjection, and calmly receive laws from man; to regions, along which the surveyor has laid his measuring-line, where every lawn and fountain is claimed by some proprietor.

Happy were it for those climes, did not the same: inconveniences arise from too great a population, which, in the countries already described, proceed from being too thinly inhabited. The more a country is peopled to a certain degree, the better; but there is a point beyond which even a multiplicity of inhabitants render each other unhappy. It is then that penal laws are increased, that wars are engaged in, in which the end only ferve to lessen the number. Among polite nations, whatever may be the pretext for war, if it be examined to the bottom, will be found to proceed from a nation, by long peace becoming too numerous, and consequently desirous of occupying those regions possessed by another: instigated by the fame motives, the rival nation answers the challenge, both fight; some two or three hundied thousands are flain on either side; and each nation thus diminished of its inhabitants, now begins to look round, and to find that the furvivors are not to numerous to destroy each other's internal welfare. Thus a peace is concluded, which leaves both nations in the very same circumstances in which they began the war; with only this difference, that the inhabitants on both fides are reduced, and more nearproportioned to the extent of the country which they possess.

If we compare the increase of a colony newly planted, with that of an equal number of the mother-country at home, we shall in general find, that the former breed up five children for one bred up by the latter. In the mother-country, from being already too populous, marriages are not entered into, as the contracting parties are not able to maintain their off-

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fpring : in colonies, where a proper extent of country is presupposed, nothing more than increase of la. bour is fufficient to maintain a numerous progeny, which growing up, are foon able without further affiftance to maintain themselves. Thus colonies have ever cultivated commerce rather than war, until they could foread no farther; and then, from the natural inconvenience of too great population, they arrived at attempting to invade that property among their neighbours by force which they were unable to polfels by legal means. War, therefore, unceafing win is the consequence of refined society: it is a natural evil, which arises from the nature of an happy and well regulated constitution, which must increase: and every country is capable of supporting only a determinate number of inhabitants.

If we compare the bodies of the inhabitants of the temperate climates with those which lie to the north or fouth, we shall find the pores of the skin much larger than in any other part of the globe, and a state of the globe, a larger than in any other part of the globe, and a manifest difference in this particular. Excessive heat or cold contract the pores of the skin; and those who have been long accustomed to either, are found no way subject to those profuse sweats, which in every part of Europe are the consequences of labours from hence the Europeans derive a continuance of youth and vigour; for their bodies daily losing or one part, and receiving new supplies on another, are not it continually changing; and, if we may so express it are thus always new: whereas in the cold and how the climates, the bodies of the natives do not receive stelly easily, addition and loss, and consequently continue more constantly the same. This will sufficiently as more count for the difference between climates, in respect to youth and age; an inhabitant of the north, or the equator, is old at twenty-sive, but continues to support nature in this state of premature debility for several years; while an European, on the contrary selection feels either the effects, or discovers the wring states. to appreciate the form

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Hes of age, till he is past fifty, and then declines in-

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That permanent vigour of the body is also the most proper to supply a fund of materials to supply the mind; as the foul often fympathizes with the decaying outward frame, before an inhabitant of the frigid or torrid zone has an opportunity of growing learned, he is grown old; the feafon for memory and invention is past; and he is, from the natural infirmihies consequent upon age, more desirous of preferring the acquifitions of knowledge he has made, than of measuring up new. On the contrary, the philosopher of the temperate climate, has a long period in which to collect his inductions; and as from the nature of the climate, a greater variety of objects offer instruction, so he has a longer period to enjoy the fruits of his acquisition. countries the second and a second

ook elodi dage talah salah Basalah salah on the same on Men, Manners, and Things.

A Brave man is not fuddenly elated by prosperity, got A or depressed by adversity: so the oak displays, are not its verdure on the sun's first approach; nor droops is it on its first departure.

how The works of a person that builds, begin immediately to decay; while those of him who plants beinut gin directly to improve; in this, planting promises

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special we have observed universally, that the quarrels of rethe friends in the latter part of life are never truly resulting to the food grown over as to leave no scar; the case is trary different in regard to old people and timber: the wring reason of this may be accountable, from the decline of the social passions, and the prevalence of spleen,

fuspicion, and rancour towards the latter part of life.

There is nothing so disagreeable, as to hear weak and servile people repeat with admiration every filly speech that falls from a person of rank and fortune; the nonsense grows more nauseous through the medium of their admiration, and shews the venality of vulgar tempers, who consider fortune as the goddess of wit:

What pleasure it is to pay one's debts! it seems to flow from a combination of circumstances, each of which is productive of pleasure: in the first place, it removes that uneasiness which a true spirit seels from dependence and obligation: it affords pleasure to the creditor, and thereby gratistics social affection. It promotes that suture considence which is so very interesting to an honest mind: it opens a prospect of being readily supplied with what we want on suture occasions: it leaves a consciousness of our own virtue; and it is a measure we know to be right, both in point of justice and sound occonomy: finally, it is the main support to simple reputation.

I cannot see why a person should be esteemed haughty on account of his taste for fine cloaths, any more than one who discovers a sondness for birds, slowers, &c. imagination influences both to seek amusement in glowing colours. It appears to me, a person may love splendour, without any degree of pride, which is never connected with this taste; but, when a person demands homage on account of the sinery he exhibits, then it ceases to be taste, and commences mere ambition: yet the world is not cough candid to make this essential distinction.

The first instance an officer gives you of his courage, consists in wearing cloaths superior to his rank.

There are certain shapes and physiognomies of so vulgar a cast, that they would scarce win respect though they were embellished with a dress as tawdry, as a pulpit cloth.

Perhaps an acquaintance with men of genius is ra-

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ther reputable than satisfactory; it is as accountable as it is certain, that fancy heightens sensibility, frengthens passion; and passion makes people humorists. Yet a person of genius is often expected to shew more discretion than another man; and this on account of that very vivacity which is his greatest impediment: this happens for want of distinguishing betwixt the fanciful talents, and the dry mathematical operations of the judgment; each of which, indiscriminately, gives the denomination of a man of senius.

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CHAP. XIII.

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The Art of DRAWING.

THOUGH some may look upon Drawing as one of those accomplishments which are rather mamental than useful, yet so elegant and agreeable as amusement for the leisure hours, as the art of Drawing affords, should by no means be neglected in the education of youth; especially where any genius or inclination that way is discovered in the pupil: and we are so far from being of opinion that it is merely ornamental; for besides, it is of great use to Painters, Engravers, Architects, Engineers, Gardeners, Cabinet-makers, Carvers, Embroiderers, Stamaries, Tapestry-weavers, and many others concerns in Designing.

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Of the proper Materials, and the Manner of using them.

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The first thing necessary is to furnish yourself with proper materials, fuch as black-lead pencils, crayon of black, white, or red chalk, crow-quill pens, a rule and compasses, camel's-hair pencils, and Indian ink Accustom yourself to hold your pencil farther from the point than you do a pen in writing, which will give you a better command of it, and contribute to render your strokes more free and bold. The use of your pencil is to draw the first sketch or out-lines of your piece, as any stroke or line that is amiss, may in this be more easily rubbed out than in any other thing; and when you have made your sketch as conrect as you can with the pencil, you may then draw carefully the best out-line you have got, with your crow-quill pen and Indian ink; after which you may discharge the pencil lines, by rubbing the piece gently with the crumbs of stale bread. Having thus got your out-line clear, your next work is to shade your piece properly (for which we shall give more particular directions in another leffen) either by drawing fine strokes with your pen where it requires to be shaded, or by washing it with your hair pencil, and the Indian ink. As to your rule and compasses, they are never, or very rarely to be used, except in meafuring the proportions of your figures after you have drawn them, to prove whether they are right or not; or in houses, fortifications, and other pieces of architecture.

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Of drawing Lines, Squares, Circles, and other regular and irregular Figures.

Your first practice must be to draw straight and curved lines, with ease and freedom, upwards, downwards, fideways, to the right or left, or in any direction whatfoever: you must also learn to draw y command of hand, squares, circles, ovals, and other geometrical figures; for as the alphabet, or a mowledge of the letters, is an introduction to grammar, fo is geometry to drawing. Be fure to make purfelf-perfectly mafter of one figure before you proged to another; the advantage, and even necessity of this, will appear as you proceed. It is practice more than precept that must teach you the art of rawing. Two observations more may be proper with regard to drawing: one is, that the pupil acouttom himself to draw all his figures very large, which is the only way of acquiring a free, bold manper of deligning; the other is, that he practice drawing till he has gained a tolerable mastery of his encil, before he attempts to shadow any figure or bject of any kind whatever.

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Light and Shade.

It is this which gives the appearance of substance, hape, distance, and distinction, to whatever bodies out endeavour to represent, whether animate or insimate: your best rule for doing this, is to consider from what point, and in what direction the light falls upon the object which you are dilineating, and et all your lights and shades be placed according to that direction throughout the whole work: that part of the object must be lightest which hath the light most directly opposite to it; if the light falls side-

ways on your picture, you must make that side which is opposite to it lightest, and that side which is farthest from it darkest. If you are drawing the figure of a man, and the light be placed above the head, then the top of the bead must be made lightest, the shoulders next lightest, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings, that stand farthest out, must be made the lightest, because it comes nearest to the light; and the light loseth as much of its brightness, by how much any part of the body bends inward, because those parts that flick out him der the luftre and full brightness of the light from firicking on those parts that fall in. TITIAN used to fay, that he knew no better rule for the distribution of lights and shadows, than his observations drawn from a bunch of grapes. Sattins and filks, and all other shining stuffs, have certain glancing reflections, exceeding bright where the light falls strongest: the like is feen in armour, brafs pots, or any other glittering metal, where you fee a fudden brightness in the middle, or centre of the light which discovers the thining nature of fuch things. Observe also, that a strong light requires a strong shade, a fainter light a fainter shade; and that an equal balance be preserved throughout the piece between the lights and shades. Those parts which must appear round, require but one stroke in shading, and that sometimes but very faint; fuch parts as should appear deep of hollow, require two strokes across each other, of fometimes three, which is sufficient for the deepet Take care also to make your out-lines faint and finall in fuch parts as receive the light; but where the shades fall, your out-lines must be strong and bold. Begin your shadings from the top, and proceed downwards, and use your utmost endeavours both by practice and observation, to learn how to vary the shadings properly, for in this consists a great deal of the beauty and elegance of drawing. Another thing to be observed, that as the human fight is

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weaken'd by distances, so objects must seem more or his confus'd or clear, according to the places they hold in the piece: those that are very distant, weak, faint, and confus'd: those that are near and on the foremost ground, clear, strong, and accurately sinished.

Drawing Flowers, Fruits, Birds, Beafts, &c.

The best thing you can do is to surnish yourself with good prints or drawings, by way of examples, and with great care and exactness to copy them: if it is the figure of a beast, begin with the forehead, and draw the nose, the upper and under jaw, and slop at the throat; then go to the top of the head, and form the ears, neck, and continue the line till you have given the full shape of the buttock; then form the breast, and mark out the legs and seet, and all the smaller parts, and last of all sinish it with the proper shadows. It is not amiss, by way of ornament, to give a small sketch or landscape, and let it be suitable and natural to the place or country of the beast you draw: much the same may be said with regard to birds.

Drawing Eyes, Ears, Legs, Arms, Hands Feet, &c.

As to the drawing of eyes and ears, legs and arms, you will have very little more to do than to copy carefully the examples which are given you in plates; but the actions and postures of the hands are to many and various, that no certain rules can be given for drawing them, that will universally hold good; get as the hands and feet are difficult members to draw, it is very necessary, and well worth while, to believe some time and pains about them, carefully i-

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mitating their various postures and actions, so as no only to avoid all lameness and imperfection, but also to give them life and spirit. To arrive at this, great care, study, and practife are requisite; particularly in imitating the best prints and drawings you can get of hands and feet; for as to the mechanical rule of drawing them by lines and measures, they are no only perplext and difficult, but also contrary to the practice of the best masters. One general rule how ever may be given (which is univerfally to be observed in all subjects) and that is, not to finish at first any fingle part, but to fketch out faintly, and with light strokes of the pencil, the shape and proportion of the whole hand, with the action and turn of it; and after confidering carefully whether this first sketch be perfect, and altering it wherever it is amis, you may proceed to the bending of the joints, the knuckles, the veins, and other small particulars, which, when you have got the whole shape and proportion of the hand or foot, will not only be more eafily, but also more perfectly defigned.

Drawing Faces.

The head is usually divided into sour equal parts;

7. From the crown of the head to the top of the forehead;

2. From the top of the forehead to the eyebrows;

3. From the eyebrows to the bottom of the nose;

4. From thence to the bottom of the chin: but this proportion is not constant; those features in different men being often very different as to length and shape: in a well-proportioned sace, however, they are nearly right. To direct you therefore in forming a perfect sace, your first business is to draw a compleat oval, in the middle of which, from the top to the bottom, draw a perpendicular line, through the centre or middle of this line draw a line diametrically across from one side to the other of your oval: on these two lines all the features of your face

are to be placed as follows: divide your perpendicu-In line into four parts: the first must be allotted to the hair of the head, the second is from the top of the forehead to the top of the nose between the eyebrows; the third is from thence to the bottom of the note, and the fourth includes the lips and chin. Your diameter line, or the breadth of the face, is lways supposed to be the length of five eyes, you must therefore divide it into five equal parts, and place the eyes upon it so as to leave exactly the length of one eye betwixt them: this is to be understood only of a full front face; for if it turns to either fide, then the distances are to be lessened on that side which turns from you, less or more in proportion to its turning: the top of the ear is to rife parallel to the eyebrows, at the end of the diameter line; and the bottom of it must be equal to the bottom of the nofe: the nostrils ought not to come out farther than the corner of the eye in any face, and the middle of the mouth must always be placed upon the perpendicular line. There is an ingenious device which perheps may affift you in forming the face according to its different turnings, and in placing the features properly thereon. Procure a piece of box or other smooth even coloured wood, and get it turned in the hape of an egg, which is pretty nearly the shape of the human head; draw a line upon it from point to point longways: divide the line into two equal parts, and draw another through that point directly across it at right angles, the features being drawn on these two lines according to the rules given you above, which will produce a fore right face. Turn the oal a small matter from the left hand to the right, and the perpendicular will appear bent like a bow or arch, upon which the particular features are to be drawn, always observing in what manner the nose projects beyond the round of the oval; the same must be observed if you turn the oval from the right to the left. A great variety of faces may be frewn

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r oface by means of a perdendicular, on which the forehead, nose, mouth, and chin are to be described. These rules being thoroughly understood, and imprinted in your mind by frequent practice, we doubt not but you will be able in a little time to draw faces from your own fancy and invention: and you will be better grounded in the art than those who merely draw from prints or pictures, without understanding any thing of the rules: but after this, we would have you carefully study and copy after the best drawings or pictures you can procure.

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Defigning.

Designing is the art of delineating or drawing the appearance of natural objects by lines on a plane. It is particularly used with painters for the idea of a large work, drawn roughly, with an intention to be executed and finished with propriety. In the simplest fense, the defign is the contour or out-line of the figures or things intended to be reprefented, or the lines that terminate and circumferibe them. Such a defign is fometimes drawn in crayons or ink, without any shadows at all: sometimes it is hatched, that is, the shadows are expressed by fensible lines, viually drawn across each other, with the pen, crayon, or engraver: fometimes again the shadows are done with the crayon rubbed, fo that no lines do appear at all; and fometimes the grains or ftrokes of the crayon appear as not being rubbed. Sometimes the defign is washed, that is, the shadows are done with a pencil in Indian ink, or in some other liquor; and others the defign is coloured, that is, colours are

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hid on much like those intended for the grand work. The qualities or parts required in a design, are. correctness, good taste, elegance, character, diver-fity, expression, and perspective. Taste is an ideaor manner of deligning, which arises either from the complexion or natural disposition, or from education, the mafters, ftudies, &c. Correctness depends prinsmally upon the justness of the proportions, and a knowledge of anatomy. Elegance gives the figure a kind of delicacy, which strikes people of judgment, and a certain agreeableness, which pleases every body. The character, is what is peculiar to each thing, in which there must be a diversity, inasmuch as every thing has its particular character to diffinguish it. The expression, is the representation of an objed, according to its character, and the feveral circumstances it is supposed to be in. The perspective. is the representation of the parts of a painting or figure, according to the fituation they are in, with respect to the point of fight.

The defign or draught is a part of the greatest import and extent in painting; it is acquired chiefly by application, and the principal rules are as follows:

I. That young beginners accustom themselves to copy after good originals at first fight; not to use squares in drawing, for sear of stinting and confining their judgment.

2. To stay till they can design well after the life, before they begin the practice of perspective rules.

3. In designing after the life, to learn to adjust the bigness of their figures to the visual angle, and the distance of the eye from the model or object.

4. To mark out all parts of their defign, before

they begin to shadow.

5. To make their contours in great pieces, without taking notice of the little mufcles and breaks.

6. To make themselves masters of the rules of

perspective.

7. To observe every stroke as to its perpendicular, parallel, and distance; and particularly so to compare

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and oppose the parts, which meet upon, and traverse the perpendicular, so as to form a kind of square in the mind; which is the great, and almost the only rule of designing justly.

8. To have regard not only to the model, but also to the part already defigned; there not being any such thing as designing with strict justice, but by comparing and proportioning every part to the first; the

rest have a relation to perspective.

CHAP. XIV.

PAINTING.

Oils necessary.

oil of Nuts and Lintfeed oil. Oil of Spike, which is made of Lavender flowers, ferves to make the colours run better, and renders the touching the picture over again the more easy; it also takes off the glittering of a picture, and is proper to do the same by the fifth and clean it: but the painter must take care it does not take off the colour too.

Oil of Turpentine, which is drawn from Rosin, is good to touch a picture over again with; but especially to mix with Ultramarine and Enamels; because it helps to spread them, and evaporates immediately. When the artist would make use of it, it is not necessary he should make much use of other oil, which will only turn the colour yellow.

Oil of Nuts is used by painters, boiled up with the scum of Lead, in which Silver has been melted

by a quick and great fire; to this add an Onion, whole and peeled, which is taken out after it has boiled; this takes away from the oil its greafy quality. Oil of Nuts is also boiled with the powder of Azure and Enemel, which being boiled, is set to stand a little, and then the top taken off, This is used to temper White, and the other colours, which the painters would have be kept clean.

Oil of Turpentine is used to dissolve the colours, and make them spread the better, and to make the

work dry the fooner.

Fat Oil: Put Lintfeed oil into leaden veffels, made in the form of dripping-pans, so much as to be an inch deep; expose them to the sun for six months, till it becomes as thick as Turpentine; the longer it stands the fatter it will be, and give Gold a greater gloss. If it is almost as thick as butter, so as you may in a manner cut it with a knife, it is excellent, and ought to be carefully kept for use.

To make Drying Oil: Mix a quart of Lintseed oil with three ounces of Lithrage of Gold, and boil them for a quarter of an hour; but if you would have it more drying boil it a little longer; but beware of

boiling it too thick, fo as not to be fit for use.

Colours.

Lead, Spanish White, and Egg shells burnt. The Spanish White is thus made: Take fine Chalk six ounces, alum two ounces; grind them together in fair water, will it be like pap; roll it up into balls, which dry leisurely; then put them into the fire till they are red bot; take them out and let them cool: This is the best White to garnish with, being ground with weak Gum water. 2. The chief Blacks are, Hartshorn burnt, Ivory burnt, Lamp black, Charcoal, Sea-coal, Verditer, Mummy burnt. 3. The chief Reds are, Carmine, Vermillion, Red Lead, Indian Lake, Native Cinnibar, Red

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Oker, Yellow Oker, burnt, and Indain Red. 4. The chief Greens are, Green Bice, Green Pink, Verdigreafe, Vediter, Sapgreen, and Pink mixed with Bice. 5. The chief Yellows are, Orpiment, Massicote deep and light, Saffron, Pink-yellow dark and light, Oker-de-luce, English Oker, Roman Oker, and Gall Stone. 6. The chief Blues are, Ultramarine, Indigo, Smalt, and Blue Bice. 7. The chief Browns are, Umber, Spanish Brown, Cologn Earth, Gall Stone, tust of Iron, and Mummy.

This is to be noted, that, of the colours before named, Vermillion, Verdigrease, Orpiment, and some others, are too coarse and gritly to be used in Water-colours, unless they be purified and prepared; and Turnscle, Litmos Blue, Roset, Brasil, Logwood, and Soffron, are more fit for washing prints than curious

limning.

Colours in painting, is a term applied to both the drugs, and the tints produced by those drugs, variously mixed and applied. Painters reduce all the colours they use under these two classes, Dark, and Light Colours. Dark colours are Black, and all others that are obscure and earthy, as Umber, Bistre, &c. under light colours are comprehended White, and all those that approach nearest it.

Painters also distinguish colours into simple and mineral: under simple colours they rank all those which are extracted from vegetables, and which will not bear the fire; as the yellow made of Saffron, French Berries, Lacca, and other tincture's extracted from

flowers used by limners, &c.

The mineral colours are those which are drawn from metals, &c. and which are able to bear the fire: used by enamellers. Colours are also divided, by some, into changeable and permanent: changeable colours are such as depend on the situation of the objects with respect to the eye, as that of a Pigeon's neck, Tasety, &c. the first, however, being aftentively viewed with a microscope, each sibre of the seathers appears composed of several little squares alternately red and green, so that they are fixed colours.

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KIRCHER says, that the changeable colour observed in the wings of Pigeons, Peacocks, &c. arises from the seathers being transparent, and of a sigure resembling a prism; and, consequently, the lights being differently refracted from them. Permanent colours are not exhibited by refraction, but by resection.

Particular Colours.

Cerus.—Grind it with glair of Eggs, and it will make a very good White: it is too yellow for some purposes, coarse, and gritly. Spanish White, being ground with Gum water, is the best White of all to garnish with.

White Lead.—Grind it with a weak water of Gum Lake, and let it stand three or four days, and, if it be afterwards mixed with Roset and Vermillion, it will make a fair Carnátion.

Lamp Black.—It makes a good Black, being ground with Gum water.

Vermillion.—If it be ground with the glair of an Igg, and a little clarified Honey, to make it bright and perfect, is good; but Native Cinnibar is better, and of a more lively colour. Cinnibar Lake makes a deep and beautiful Red, or rather Purple, almost like a red rose; grind it with Gum Lake, and Turnsole-water; if you will have it light, add a little Ceruss, and it will make it a bright Crimson; if it be to diaper, add only Turnsole water.

Red Lead — Grind it with some Saffron and a stiff Gum water; the Saffron will make it orient and of a Marigold colour.

Turnfole,—Lay it in a faucer of Vinegar, and set it over a chasing dish of coals; when it boils, take it off, and wring it into a shell, adding a little Gum Arabic; let it stand till it is dissolved; this is good for shadowing Carnations and all Yellows.

Rolet .- Grind it with Brafil-water, and it will

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make a deep Purple; put Cerus to it, and it will be lighter; and it will make a fair Violet.

Green Bice .- Is to be ordered as you do Blue Bice, when it is moift and not thoroughly dry, you may dia-

per with the water of a deep Green.

Orpiment, Arfenicum, Aufpigmentum .-- Grind it with a fliff water of Gum Lake, because it is the best colour itself; it will lie upon no Green, for all Greens, White and Red Lead, and Cerus, Stain it; wherefore you must deepen your colours so, that the Orpiment may be highest, and so as it may agree with all colours.

Maflicote: - Grind it with a small quantity of Saffron in Gum water, and never make it lighter than it is; it will endure to lie upon all colours and metals.

Saffron.-Steep it in glair, it may be ground with Vermillion.

English Oaker .- It is a Yellow colour, and lies even in the shell of itself: It is of great use being well

ground.

Cherry Stone .- Is burnt in a crucible, and ground. It is good for drapery, and for a black Sattin; temper it with a little white Indian Lake, and Indigo: heighten it with a little lighter mixture; deepen it with Ivory black.

Caput Mortuum of Vitrel .- First grind it well upon a marble; then wash it well, and grind it with a weak Gum Lake water; it will make a deep Red, or

almost a Purple colour.

Spanish Brown .- Grind it with Brasil-water, min gle it with Cerus, and it will make a Horfe flesh colour. It is not so brisk and lively as Indian Red:

Bole Armoniac .- Makes but a faint colour; the chief use of it is in making Size for burnished Gold.

Verdigreafe. - Grind it with juice of Rue and a little weak Gum water, and you will have a most pute ywa Green; if you would diaper with it, grind it with Ley of Rue, or the Decoction thereof, and it will that t make a hoary Green. Diaper upon Verdigreafe green

with Sap-green. Verdigreafe, ground with White Tartar, and then tempered with Gum water, gives a most perfect Green, barring ou et el

Verditer - Grind it with a weak, Gum-Arabic-wa ter; it is the faintest Green that is, but is good to lay

upon Black in any kind of Drapery.

Sap Green .- Lay it in tharp Vinegar all night, put into it a little Ailum to raise its colour, and you will have a good Green to diaper with upon other Greens.

Pink-Yellow .- If you would have it fad-coloured, find it with Saffron; if light, with Cerufs; mix it

with Gum water, and so use it.

Oker-de luce .- Grind it with pure Braul-water, and it will make an excellent Hair-colour, and is a natural shadow for Gold; Roman Oker is the most

glowing Oker of all.

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Umber.—Is a fad Brown colour; grind it with Gum water, or Gum Lake, and lighten it if you please ven with a little Cerus, and a blade of Saffron to cleanse ell it; burn it in a crucible, then grind it and it will be good; and when you temper it in the shell, use a drop or two of Onion water, and it will preserve it m- from cracking.

Ultramarine.—If you would have the fine Cerus; it it with Litmos-water, but if light, with fine Cerus; In grinding Ultramaand a litle Gum-Arabic-water. In grinding Ultramaon time and other colours, be not too swift in your mo-hation; but let it be gentle and flow, which will cause or jour colour to starve, or lose somewhat of its lustre, especially if it be a colour of no great body, as Pink,

sin hdigo, &c.

Blue Bice.—Grind it with clean water, as fine as an be, and then put it into a shell, and wash it as sold. Shell or vessel you put it into, and stir it well; let it stile sand for an hour, then throw away the filth and directly water, and put in more clean water; do this 4 or stimes; then put some weak Gum-Arabic water to it, will that the Bice may fall to the bottom; pour off the Gum water, and put more to it; wash it again, dry

it, and mix it with weak Gum water, if you would have it rife of the same colour; but with a stiff water of Gum Lake, if you would have a most perfect Blue; but grind it with a little Ceruss, if you would have it a light Blue; if you would have it a very deep Blue, add Litmos water.

Smalt.—Grind it with a little fine Rosetta, and it will make a deep Violet, and by putting in a quantity of Cerus, it will make a light Violet.

Ivory-Black.—Grind it with a little white Sugar. Candy, and it will preferve it from cracking out of

your shells; it makes a good Black.

Pink.—Mixed with Blue Bice, makes good Green; the fairest Pink is best, well ground and tempered with Blue Bice, allowing one quantity of Pink to three of Blue Bice. If you would deepen it for Landscapes or Drapery, mix a little Indigo finely ground with it.

Indian Lake.—This makes a delicate Purple; grind i with a little Gum water, and when it is fine, before you put it into the shell, mix a little powder of white Sugar-Candy with it, which will preserve it from cracking; then you may spread it thinly with your finger about the shell.

Indian Red.—Makes a very dark Red; because this colour is very coarse, you may use Umber and a little

Lake tempered, which is very good.

Observations on Mineral Colours.

1. Sublimate. — Diffolved in fair water, and mixed with a little Spirits of Urine, makes a good Mills White-mixture in a moment; which, by an addition of Aqua-fortis, becomes transparent again immediately.

2. If you sublime together two ounces of Sublimate, and one ounce of Tin Glass, you will have a Sublimate not inserior to the best orient Pearls in the world. Mercury Sublimate and Precipitate yield, with the Spirit of Urine, Hartsborn, or the like, White

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Tarta becom Blue so my Precipitate; but with the solution of Pot Albes, or

other lixiviate Salts, an Orange Tawney.

2. Fine powders of Blue Bice and Yellow Orpiment, lightly mixed, produce a good Green; and a high vellow foliation of a good Gold in Aqua Regia, mixed with a due quantity of a deep Blue folution of crude Copper in Spirit of Urine, produces a transparent Green , and to Blue and Yellow Enamel, fused together in the flame of a lamp, being strongly blown on without ceasing, produces at length a Green colour.

4. Verdegreafe .- Ground with Sal Armoniac and the like, digested for a while in a Horse dunghill, makes a glorious Blue; and Spirits of Sal Armoniac make the solution of Verdegrease an excellent Azure.

5. Quickfilver .- Mixed with three or four times its weight of good Oil of Vitriol, and the oil drawn off in fand, through a glass retort, leaves a snow-white Precipitate, which, by the effusion of fair water, becomes one of the lovelieft light Yellows in the world. and is a durable colour.

Lastly, Good Vermillion is made of Mercury and Brimfione, sublimated together in due proportion.

Observations on Vegetable Colours.

1. A decoction of Red Roses, dried in fair water, mixed with a filtrated folution of Blue Vitriol, makes a Black Colour; and this being mixed with a little Aqua Fortis turns it from a Black to a deep Red: which, by the effusion of a little Spirits of Urine, may be prefently reduced to a thick and black colour,-2. Syrup of Violets mixed with a little juice of Lemons, Spirit of Salt, Vinegar, or the like, Acid Salt, will immediately become red; but mixed with oil of the become a perfect Green; and the like in the juice of with Blue Bottles. - 2. Tingues Collins Thit so much with fair water, will never yield a Yellow

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Colour. A fingle drop of a deep Solution in Spirit of Urine, dilated in an ounce of fair water, makes a fair Pink or Carnation—4. Infusion of Logawood, in fair water, mixed with Spirit of Sal Armoniac, immediately turns into a deep, rich, lovely Purple—5. The juice of Privit Berries, with Spirit of Salt is turned into a lovely Red, but with a strong Solution of Pot Aspes, into a delightful Green.—A few grains of Cochineal, being mixed with the Lixivium of Quick Lime in a due proportion, makes a fading Purple colour of the greatest glory imaginable.—7. Spirits of Sal Armoniac will turn Syrup of Vielets to a lovely Green.—8. Infusion of Litmose in fair water will, in a clear glass, give a Purple Colour; but will be wholly changed into a glorious yellow, by spirit of Salt being added.

It has not been yet found, that to exhibit the strong variety of Colours, there is need that any more than these sive be applied, viz. White, Black, Red, Blue, Yellow; for these being variously compounded, exhibit a variety and number of colours: so many, that those who are strangers to painting, can hardly imagine. So Black and White, variously mixed, make a vast company of light and deep Greys, Blue, and Yellow, a great variety of Greens; Red and Yellow, several Orange Tawnies; Red and White, a number of Carnations; Red and Blue, several Purples, and thus are many colours produced, for which we

want names.

Of preparing Colours.

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Colours, according to their nature, have each a particular way of proportion, viz. by grinding, washing, and steeping. The chief colours to be ground are White Lead, Gerus, Cinnabar, Lake, Oker, yellow

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and brown, Pink, Indigo, Umber, Cologn Earth, Spanift Brown, Ivory black, Cherry-flone black, Lampblack, Indian Red, and Indian Lake.—The chief cobours to be washed are, Red Lead, Masticote, Green,
Bice, Gedar Green, Ultramarine, Blue Bice, Smalt,
and Verditer. The chief colours to be steeped are,
sap Green, Saffron, Turnscle, Stone Blue, and French
Berries.

The Method of Grinding Colours.

Take the colour you would grind, and fgrape off from it all the filth; then lay it upon the stone, and with the muller, bruile it a little, then put to it a little bring, or weak Gum water, and grind them altogether very well, till the colour is very fine; which done, pour it out in certain hollows or furrows cut in chalk stone, and there let it lie till it is dry, which preserve in paper or glasses. Take care in grinding your colours not to put too much water in them upon the stone, for they ought to be ground pretty thick, like pulp or pap; and they ought not to be left too moilt, but thick and clammy. If after your colour is dry in the shell, you can rub it off with your fingers, it must be better bound with gum; and, if there be too much gum, it will shine, and be apt to crackle off after it is used.

To make an excellent GREEN.

The Liver of a Lamprey makes an excellent Green, and Yellow laid upon Blue will change into Green; so likewife the juice of Blue Flower-de-lis, mixed with Gum water, will be a perfect and durable Green or Blue, according as it is used.— To make a Light Green: It is made of Pink or Smalt with White, to make it whiter if need require.— To make a Lead Colour: It is made of White Lead mixed with Indigo.

To make a FLESH COLOUR.

Mix a little Lake and Red Lead with White, a very

so red as you please, by putting more or less White in it. If you would have a swarthy complexion to distinguish a man's slesh from a woman's, put a little Yellow Oker among your Flesh Colour; and for your Shadow, put a little more Lake, and a small quantity of burnt Umber.

To make a Murrey.

Which is composed of Purple and White; it is made thus: Take Cinnabar Lake two ounces; White Lead one ounce; and grind them together.

To make good MURREY.

Temper Rosin with a little Rose Water, in which a little Gum hath been dissolved, and it will be good, but not better than the first.

To make pure LAKE.

Take Urine ten pounds, boil it in a kettle, and skim it with an iron skimmer, till it comes to eight pounds; to which add Gum Lake, half a pound; Alum, two ounces and an half; boil it all till it is well coloured, which you may try by dipping a piece of linen cloth into it; then add Roche Alum in powder, a sufficient quantity. Strain it, and let it stand; strain it again through a cloth, till the liquor be clear; that which remains in the cloth or bag is pure Lake.

To make a deep PURPLE.

This is made of Indigo, Spanish Brown, and White. To make another Purple: Boil Logwood in Vinegor and Beer, in a glazed earthen veffel, adding thereto a little Alum, till you take it to be strong on your tongue, when it is sufficiently boiled, strain out the iquor through a cloth, and keep it in a glass close stopped for use.

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To make a YELLOW, GREEN, and PURPLE.

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Buckthorn Berries gathered green, steeped in Alum Water, yield a good Yellow; but being thorough the and black, they yield a good Green: and lastly, being gathered when they are ready to drop off, which is about the middle or end of November, their juice mixed with Alum Water, yields a good Purple Colour.

To make a PEAR GREEN.

Take white Tartar and Verdegreafe, temper them with strong White Wine Vinegar, in which a little Gum Arabic has been dissolved.

To make CLOUD COLOURS.

You may sometimes take Blue Verditer, sometimes light Massicote shadowed with Blue Verditer, or Lake and White, or Red Ink and White, shadowed with Blue Verditer.

To make a RED COLOUR.

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Take the roots of the Leffer Bugloss, viz. Alkanet, and beat them, and strain out the juice, and mix it with Alum Waters

To make a SCARLET COLOUR.

It is made of Red Lead, Lake, and Vermillion; yet in this cafe Vermillion is not very useful.

To make VERMILLION.

Take Brimstone in powder, four ounces; mix it with Quick silver, a pound; put it into a Crucible well luted, and upon a charcoal fire, heat it till it is red hot, then take it off, and let it cool.

A Saffron Colour is made of Saffron alone, by In-

To make a YELLOW.

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Take the Yellow Chives in White Lilies, steep them in Gum water, and they will make a perfect Yellow; the same from Sastron and Tartar tempered with Gum water.

To make a pure PURPLE COLOUR.

Take fine Brimstone, an ounce and a half; Quicksilver, Sal Armoniac, and Tin, of each one ounce; pulverise the Salt and Brimstone, and make an Amalgama with the Quick-silver and Tin; mix all together, which put into a great glass gourd; make under it an ordinary fire, and keep it in a constant heat for the space of six hours.

Tempering Colours.

Take a little of any colour, and put it in a clean shell: add to it a few drops of Gum water, and with your singer work it about the shell; let it dry, and when dry, touch it with your singer; if any colour comes off, you must add stronger Gum water; but being dry, if the colour glister or shine, it is a sign there is too much Gum in it, which you may remedy, by putting in fair water.

To help the defect of CoLours.

Some Colours, as Lake, Umber, and others which are hard, will crack when they are dry; in this case, in tempering them, add a little White Sugar Candy in very fine powder; which mix with the colour and fair water, in the shell, till the Sugar Candy is diffolved.

To prepare Shadows for Colours.

White is shaded with Black; and contrarywise, Yellow with Umber and the Okers; Vermillion with Lake, Blue Bice with Indigo, Black Coal with Roset, &c.

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To wash CoLours.

Put the Colour into a glazed vessel, and put fair vater to it plentisulty; wash it well, and decant, after awhile, the water; do this fix or seven times; at last put the water, being just troubled, into another glazed vessel, leaving the dregs at bottom; then into this second vessel put more fair water, washing it as before, till the water, being settled, be clear, and the colour remain fine at the bottom. Before you take the colour out of the vessel, spread it very thin about the sides thereof, and when it is dry, some of it will fall to the bottom, which keep by itself; but the remainder which sticks to the sides of the batom is the best of all, which, with a feather, strike off from the sides of the vessel, for it will be siner than any slour.

Steeping CoLours.

Take a quantity of the colour, put it into a shell, and sill the shell with fair water, to which add some sine powder of Alum to raise the colour; let it thus steep a day and a night, and you will have a good colour. Saffron steeped in Vinegar gives a good colour; and the French Berries, in fair water, and a little Alum, or a drop or two of Oil of Vitriol, makes a Yellow. But some colours are to be boiled, as Brazil, Logwood, Turnsole, rinds of Walnuts, Woodfoot, &c. These, when boiled, are to be kept close stopped in Glasses till you have occasion to use them.

INSTRUMENTS necessary.

1. The Easel—Is a frame made of wood, much resembling a ladder, with flat sides and full of holes, to put in two Pins to set the Straining Frame and Cloth upon, either higher or lower at pleasure, being something broader at the bottom than at the top; on the backside of which is a Stay, by which the Easel may be set either more slopping or more upright.

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Pear or Walnut tree, about a foot in length and ten inches in breadth, in almost an oval form, at the narrow end of which is a hole to put in the thumb of the left hand, near which there is a notch cut, that the Pallet may be held in the hand; the use of this is to hold and temper the colours upon.

3. The Straining Frame—Is made of wood, on which the primed Cloth that is to be painted upon is fastened with nails: these frames ought to be of several fizes, according to the fize of the cloth.

ed upon, and is to be prepared as follows: Take good Canvas, and first smooth it over with a sleet Stone, fize it over with good Size and a little Honey, and let it stand to dry; then lay it over once with Whitning and Size, mixed with a little Honey, and the cloth is prepared; the use of the Honey is to prevent it from cracking, peeling, or breaking out.

ing, from the thickness of a pin to that of two inches diameter, which are called by several names; as Dutch Quill sitched and pointed, Goose Quill sitched and pointed, Swan Quill sitched and pointed, Jewelling Pencils, and Grifle Pencils, some in Qills, some

in Tin Cases, and some in Sticks.

6. The Stay, or Molflic—Is a Stick, generally of Brasil wood, in length about a yard, having a small ball of Cotton at one end of it, fixed hard in a piece of Leather, about the size of a Chesnut, which is to be held in the lest hand while you are working; and laying the end which hath the leather ball upon the cloth or frame, you may rest your right arm upon it.

Colouring in PAINTING.

Colouring, in its general fense, takes in what relates to nature and union of colours, their agreement antipathy, how to use them to advantage in light and shadow, so as to shew a Relievo in the Figures, and a sinking of the Ground. What relates to Actual Perspective, that is the dimunition of colours, means of the interposition of air; the various actual and circumstances of the Luminary and the Medium; the different lights both of the bodies illuminating and illuminated; their respect to the position of the eye or object: what produces the strength, siercesels, sweetness, &c. in Paintings well coloured, is the various manners of colouring both in Figures, landscapes, &c. The doctrine of Colouring is commised under the following rules: Colours are considered either in respect of their use, or their econo-

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First, in respect to their use: They are applied other in oil or water; those in oil, again, are considered with a view either to their preparation or apdication. In the preparation of Oil colours, care must be taken that they be ground fine; that, in patting them on the Pallet, those which will not dry of themselves be mixed with Drying Oil, or other ingredients of a drying quality, and that the tinged colours be mixed in as small quantities as possible. for their application, it is confidered either in rebect to the kinds of painting in works of various colours, or in those of one fingle colour. For the first in the larger pieces, the colours are either laid on full, so as they may be impasted, or incorporated together, which makes them hold the more firmly; or de the more agreeable ones are mixed, which dry too hard and hastily, with a little colour, and the clearest of the oil; but in both cases the colours are to be laid on strongest at first, it being easy to weaken those that are to be thrust back, and to heighten others; the touches to be hold by the conduct of a fleady pencil, that the work may appear the most fiwished at a proper distance, and the figures animated with life and spirit.

As to Glazed Colours, care is to be taken that the under colours be painted strong, and that it be a body colour and laid smooth. In finishing works, which are to be viewed near at hand, they proceed either by applying each colour in its place, preserving their purity without fretting or fermenting them, but sweetly softening all their extremities; or by filling up all the great parts with one single colour, and laying the other colours which are to form the little things upon it, which way is the more expeditious,

but the more apt to decay, For the fecond, the kinds of pictures in one colour are two, where the degradations of colours of objects afar off are usually managed by lights, as with Crayons and Basso-Relievo; which is an imitation of Sculpture of whatfoever matter and colour; in both these the colours are wrought dry. As for Water Colours, they are wrought various ways, viz. in Diftempers, where the colours are prepared in Size, which method is used on all kinds of matter, in Frefco or Painting on frell Mortar; where the colouring must be quick, that the matter dry not, and with much care and neatness laying each colour in its place, and intermingling them by parcels. In Agouache, where the colours are mixed with Gum, and the Pencil dragged as in Paintings and Washings. In Miniature, or small and delicate works, where the colours are to be very fine and clean, mixed with Guras, and wrought with Dots or Points; but in all kinds of paintings, both in Oil and Distemper, especially the latter, care must be taken that the defign be fixed, and all the parts marked out, before any colours be applied.

2. But in the second part of Colouring, or the economy and dispensing thereof in paintings, regard is had, either, first, to the quality of the colours, to appropriate them according to their value and agreement; or, secondly, their effect and economy of the work; as to the first it must be observed, that White represents Light, and gives the briskness and heigh-

tening cures the lig bolen olour! woide not to hen lowir ng of he pa out to to difp mutua ness: As ation the fir be fwe pal on

> hy the lection As regard servern lweet lades makes

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others repose to pretion, that

prefer carrie tify t qualiweak tening; on the contrary, Black, like Darkness, obfures and estaces the object; again, Black sets off
the light parts, and by that they serve each other to
hosen the objects. A proper choice is to be made of
colours, and the too much charged manner is to be
noided, both in Carnations, where red colours are
not to be affected, as rather resembling the sless
when slead, than the skin; and also in all bright
dowing colours; the skin how delicate soever, being of a Down colour. Also in the Drapery, where
the painter has his whole slock of colours to chuse
the painter has his whole slock of colours to chuse
the dispose of those colours near one another, which
mutually assist and help each other's force and brisktes; as Red and Green, Yellow and Blue.

As to the effect of colours, they either have rebition to the union or the economy; with respect to the first, care must be taken, that they be laid so as to be sweetly united under the briskness of some principal one: that they participate of the prevailing light of the piece, and that they partake of each other by the communication of light and the help of re-

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As for the economy in managing their degrees, regard is to be had to the contrast or opposition inerrening in the union of the colours; that by a weet interruption, the briskness which otherwise ides and palls, may be raised to the harmony which makes the variety of colours agree; furplying and Maining the weakness of some by the strength of others; neglecting some places to serve as a basis or epose to the light, and to entrance those which are prevail through the piece. As to the degradaion, where, the better to proportion the colours that fall behind, some of the same kind are to be preserved in their purity, as a standard for those carried afar off to be compared by, in order to justify the dimunition; regard being always had to the quality of the air, which, when loaded with vapours, weaken the colours more than when clear. Rela-

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tive to the lituation of Colours, care must be taken that the pureft and ftrongest be placed before or i the front of the piece; and that compound one which are to appear at a distance, be kept back by their force: the glazed colours particularly to be uled i

Colours are to the eye, what founds are to the fo finear, tastes to the palate, or any other object of or Gelde senses, are to those senses; and accordingly, an ey me uthat is delicate, takes in proportionable pleasure sent from beautiful ones, and is as much offended wit uncts their contraries. Good colouring therefore in a pic the leture is of consequence, not only as it is a truer representation of nature, where every thing is beautiful in this its kind; but as administring a good degree of please fure to the sense. The colouring of a picture must hat he be varied accroding to the subject, the time, an this flor place: If the subject be grave, melancholy, or ter ther, rible, the general tint of the colouring must incline by is to Brown, Black, or Red, and gloomy; but you haves must be gay and pleasant in subjects of joy and to with umph.

Morning, Noon, Evening, Night, Sunshine, we have be and cloudy Weather, influence the colours of things hey cand, if the scene of the picture be a room, ope her rair, partly open, and partly inclosed, the colouring lows: air, partly open, and partly inclosed, the constant must be accordingly. The distance also alters the medium of air through have; which every thing is feen, which being Blue, the fint is more remote any object is, the more it must partak be yet of that colour, and, of consequence, must have less force or strength: the Ground therefore, or what he surfacever is behind a Figure, for example, must not be test; so strong as that figure is, nor any of its parts which aried round off as those that come nearer to the eye; and le, & that not only for the reason already given, but be cause there will always be restections, stronger of the weaker, that will diminish the force of the shadows OT

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which reflections, by the way, must partake of the colours of those things from whence they are promeed. We per about his warning and to trod .

Any of the feveral species of colours may be as leautiful in their kinds as others; but one kind is more fo than another, as having more variety, and confisting of colours more pleasing in their own naure; in which harmony and agreement of one tinct with another, the goodness of Colouring consists. To fliew the beauty of variety, we will instance in a Gelder Rose, which is white, but having many leaves me under another, and lying hollow, fo as to be ire fen through in some places, which occasions several vit incles of light and shadow; and with these, some of pic the leaves having a greenish tinct, altogether produli in this paper though it is white; nor in the infide of les in Egg fheil, though whiter; nor any other object, hat has not that variety. And this is the case, though his flower be feen in a room, in gloomy or wet weaan her, but let it be exposed to the open air, when the ly is ferene, the Blue that those leaves or parts of eaves, that lie open to it, will receive, together with the reflections that then will also happen to tr like upon it, will give a great addition to its beauwe by but let the fun beams touch up its leaves, where ngs hey can reach with their fine yellowish tina, the opper her retaining the Sky blue, together with the shathe line with the sky blue, together with the sharing lows and brisk reflections it will then receive, and the lan you will see what a perfection of beauty it will have; not only because the colours are more pleath int in themselves, but there is greater variety. A stak by entirely blue would have less beauty than it has, le tere it not always varied towards the horizon, by le tere it not always varied towards the horizon, by what he fun beams, whether rifing, fetting, or in its protest befs; but neither has it that beauty, as when more which aried with clouds, tinged with Yellow, White, Puran le, &c.

A piece of Silk or Cloth, hung or laid flat, has are out the beauty though the colour of it be pleafing, lows

as wher flung into folds; nay, a piece of Silk that has little beauty in itself, may be much improved only by being pinked, watered, or quilted; the reason is, in these cases there arises a variety produced by lights, of ades, and reflections. There are certain colours ress agreeable than others, as a Brick wall, for example; yet, when the sun strikes upon one part of it, and the Sky tinges another part of it, and the shadows and reflections the rest, this variety shall give even that a degree of beauty. Persect Black and White are disagreeable, for which reason, a painter should break those extremes of colours, that there may be a warmth and mellowness in his work; let him, in Flesh especially, remember to avoid the Chalk, the Brick, and Charcoal, and think of a Pearl and a ripe Peach.

But it is not enough, that the colours in themselves are beautiful singly, and that there is variety, they must be set by one another, so as to be mutually assistant to each other; and this not only in the object painted, but in the ground, and whatsoever comes into the composition, so that as every part, and the whole together, may have a pleasing effect to the eye, such a harmony to it as a good piece of music has to the ear; for which no certain rules can be given, no more than for the latter, except in some few general cases, which are very obvious, and need not therefore be mentioned have.

The best that can be done, is to advise one who would know the beauty of colouring, to observe Nature, and how the best Colourists have imitated her. What a lightness, thinness, and transparency, what a warmth, cleanness, and delicacy, is to be seen in good pictures! he that would be a good Colourist himself, must moreover practise much, and for a considerable time accustom himself to see well-coloured pictures only; but even this will be in vain, unless he has a good eye in the senses, as one is said to have good ear for music; he must not only see well, but

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have a particular delicacy with relation to the beauty of colours, and the infinite variety of tincts.

ly be being pinked, watered, or quilted: the realon is

there arides a variety produced by light The various Forms and Degrees of Colouring.

le than others, as a Brick wall, for ex-There are four various forms or degrees of co-

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1st. Infants or young Children are to be painted of a foft and delicate complexion, the skins and ears of a ruddy and pleasant colour, almost transparent. This may be done with White Lead, Lake, and a litthe Red Lead, shadowing it thin, faint, and soft, letting the Cheeks, Lips, Chin, Fingers, Knees, and Toes be more ruddy than the other parts; making all their linen very fine, thin, and transparent, or perspicuous,

with strong touches in the thickest folds.

2d. Virgins and fair Women are as curiously to be expressed as the former, but their muscles ought to appear more plainly; their shapes more perfect, and their shadows to be of a Whitish Yellow, Bluish, and in some places almost Purple; but the most perhed and exquisite direction is the life, which ought ather to be followed, than any thing delivered by rule; for the shadows here, mix White with Pink, and Indigo and White; and in some places Lake, with alittle Indigo and White. As for Women's bodies, viz. fuch as are naked, they are to be represented loft, round, plump, gentle, and tender, and without nuscles; on the contrary, the bodies of Men are to represented frong, flurdy, stout, and vigorous, with the muscles exactly placed and strong; which, to with judgment and understanding, requires time, tudy, and knowledge in Anatomy.

3d. Naked Bodies are to be painted frong, lively, and accurate, exactly matching the respective pairs muscles and nerves, fixing each artery in its due we and proper place, giving each limb its proper motion, but but, and fituation, with its true and natural colour;

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4th. Old or aged bodies ought to be eminent for exact and curious shadows, which may be made of Pink, Lake, Ivory Black, which make very proper shadows in appearance, like the wrinkles and furrows of the face and hands in extreme old age. Let the Eyes be dark, the Aspect melancholy, and Hair white, or elfe the Pate bald, and all the remarks of antiquity or age be very apparent. Pink mixed with Lake and Red Lead make an excellent shadow for the bodies of old Men; but for the extremest or deepel shadows, either in the Face or Body, mix Lake and Iyory Black, which will make an excellent deep sha tlow, and will be very useful in expressing the seve ral furrows and wrinkles in the face and hands of very old people, with their dark eyes and melanchol aspects; but notwithstanding all the foregoing rules the posture or form of standing, and being, either of the whole body, or any of its parts, ought to be di ligently observed, that the life may be imitated.

Composition.

Composition, is putting together for the advantage of the whole, what shall be judged proper to be the several parts of a Picture; either as belonging to it, or because they are thought necessary for the common benefit; and moreover, the determination of the painter, as to certain attitudes and colours, which are otherwise indifferent.

The Composition of a picture is of vast consequence to the goodness of it: it is what first of all present itself to the eye, and prejudices us in favour of, o with an aversion to it: it is this that directs us to the ideas that are to be conveyed by the painter, and in what order; and the eye is delighted with the harmony, at the same time the understanding is improved: whereas this being ill, though the severa parts are fine, the picture is troublesome to look upon, and like a book, in which are many good thoughts.

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Every picture should be so contrived, as that at a distance, when one cannot discern what figures there are or what they are doing, it should appear to be composed of masses light and dark; the latter of which ferve as reposes to the eye. The form of hele masses must be agreeable, of whatever they enlift, Ground, Trees, Draperies, Figures, &c. and the whole together should be sweet and delightful; lovely shapes and colours, without a name; of which there is an infinite variety: and it is not esough that there be great masses; they must be subdivided into lesser parts, or they will appear heavy and disagreeable; thus, though there is evidently a broad light (for example) in a piece of Silk, when overing a whole figure, or a limb, there must be leffer folds, breakings, flickerings, and reflections, and the great mass yet evidently preserved. times one mass of light is upon a dark ground, and then the extremities of the light must not be too mear the edges of the picture, and its greatest strength must be towards the centre.

Sometimes the structure of a picture, or the Toutmsemble of its form, shall resemble dark clouds on a
light ground. There are instances where two masses, a light and a dark one, divide the picture, each
possessing one side: of this fort is one done by RuBENS, and as sine a composition as can be seen; the
masses are so well rounded, the principal light being
near the middle of the bright one, and the other haring subordinate lights upon it, so as to connect,
but not to consound it with the rest; and they are
in agreeable shapes, and melting into one another,

but nevertheless sufficiently determined.

Very commonly a picture consists of a mass of light, and another of shadow, upon a ground of middle tinct: and sometimes it is composed of a mass of dark at the bottom, another lighter above that, and

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another for the upper part still lighter; (as usually in a Landscape, fometimes the dark mass employs one fide of the picture also: as a certain copy after PA. OLO VERONESE, where is a large group of figures, the principal ones of the story compose the lower brown mass; Architecture, the second; more buildings, with Figures and the Sky, the third; but most commonly, in pictures of three maffes, the fecond is the place of the principal figures.

Of fuch confequence are thefe agreeable maffes in a picture, that for the fake of them, what is less material must be dispensed with, when both cannot be had: as the principal figure and action must be di-Ringuished, those himbs of a figure that are chiefly

employed, ought to be made conspicuous.

As the Tout ensemble of a picture must be beautiful in its maffes, fo it must be as to its colours; and, as what is principal must be (generally speaking) the most conspicuous, the predominant colours of that should be diffused throughout the whole. This Ra-PHAEL has remarkably observed in the cartoon of & Paul preaching; his Drapery is Red and Green, and these colours are scattered every where, but judicioully: for fubordinate colours, as well as fubordinate lights, ferve to foften and support the principal ones, which otherwise would appear as spots, and to the consequently be offensive; and when the subject does not necessarily require a due variety or beauty of tincts; or perhaps the picture, when thought to be finished, is found to want something of this kind; a few Red of Yellow leaves of trees, flowers of whatever colour, in short, any thing otherwise indifferent digo may be slung in very advantageously. may be flung in very advantageously.

In a figure, and every part thereof, and indeed and in every thing elfe, there is one part which must have see of a peculiar force, and be manifestly distinguished from the rest, all the other parts of which must also have which a due subordination to it, and to one another: the with same must be observed in the composition of an entire picture; and this principal, distinguished part, ought black

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(generally speaking) to be the place of the principal figure and action: and here every thing must be higher finished; the other parts must be less fo, gradually. The masters to be studied for Composition are RAPHAEL, RUBENS, REMBRANDT, and many others there are worthy of notice. the word Provide and and Skyl O'c mird; but mol

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cocquires of edica anadese the feed Rules for drawing Beafts.

Of the headened are a characteristic ranker For drawing the form of any beaft, begin with your Lead or Coal, at the Forehead, drawing downward the Nose, Mouth, upper and nether Chop, ending your lines at the Throat: then viewing it again where you began, from the Forehead over the Head, Ears, and Neck, continuing till you have given the full compass of the Buttock, then mark out the Legs and Feet. Viewing it again, touch out the Breast, with the eminency thereof; lastly, finish the Tail, Paws, Tongue, Teeth, Beard, and Shadows. In drawing beafts, you must be well acquainted with their shape and action; without which you will neper perform any thing excellent in that kind; and here if you draw it in an emblem or the like, you ought to thew the landscape of the country natural to that beait.

be be de l'Ibe Method of Colouring Beasts.

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that Sheep, lay with a thin White, shaded with In-

2. Hogs, lay with Brown Oker, shade with Soot, 2. Hogs, lay with Brown Oker, shade with Soot, deed and heightened with Massicote: you may, as you have see occasion, colour the Hair here and there with from stronger Brown Oker; the Eyes with Vermillion, have which you may heighten with Massicote; the Mouth the with Indigo, or White and Black, shaded with Black. entire 3. A Bear, with Brown Oker, Red Oker, and

bught Black mixed; shadow with Soot alone, or mixed

with Black, and heighten with brown Oker and and haded with Indian Blue and still W

4. A Wolf, with Brown Oker and Soot, and shadow with more Soot sell time reoles

a 5. A Grey Wolf, with Black, White, and Brown Oker : shaded with Black and Soot, or Black only; the Mouth with Black and Red Oker; shaded with Black and Soot, heightened with Red Oker and White.

- 6. The Elephant, which is of a Mouse Grey, with Black and White, mixed with Soot, and shaded with Black and Soot, and heightened with the fame, with a little more White. The Nose, at the end of his Trunk, must be laid inwardly with Vermillion and Cerufs, shadowed with Black, or Black mixed with Lake: in the same manner, the inner part of the Ears: the Eyes with White, tending to a Grey, Mice are coloured as the Elephant; Rats a little browner.
- 7. The Unicorn, with a pure White, shaded with Black; the Chops Red, the Eye and Hoofs with thin Black.
- 8. The Hart, with Brown Oker, shaded on the Back with Soot, which fweetly drive towards the Belly, and shade over again with a stronger Soots the Neck and Belly with White, the Mouth and Ears a little Reddish, the Hoof Black, the Horn with Soot, and shaded with Soot mixed with Black The Hind with the same colours as the Hart.

9. The Coney, with Black and White; the Belly all White, sweetened with Black, and heightened with a stronger White. The Hare with Brown 0 ker; the belly a little Whitish; shaded on the Back with Soot, and heightened down the Belly with White.

10 Apes, Monkeys, and the like, with Pink and Black, heightened with Masticote and White; lay the face with a thin Black, mixed with Soot, shaded with Black and Pink mixed with a little red Oker.

11. Cats, of a Grey and Brownish, or Tabby, with

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12. An Ass, colour with Black, mixed with White the Grey; if the Ass be of a mingled Brown, Black and White, mixed with Brown Oker, shaded with Black in the mouth; heighten with White, with one

13. The Leopard, with Brown and Red Oker mixed with Black, shadow it with Soot; the Spots with Red Oker and Black, the Mouth with Black and

White, heighten with light Oker. and it has sould

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14. Horfes, Oxen, Cows, Dogs, and fuch like, White, with White, mixed with a little Soot or Oker, shaded with a little Black and White, and heightened with perfect White. If of a Chesnut Brown, with Red Oker and Black, shaded with Black and Soot, and heightened with Red Oker and White. If an Ash Grey, with Black mixed with White, shaded with Black and heightened with White. If Black, with a thin Black, shade with a fronger Black, and heighten with Black and White. -A Bay Horse, with Vermillion and Brown Oker; bronly with Red Chalk, shaded with red Oker, and heightened with Red Chalk, mixed with White. If spotted, by a mixture of the aforesaid colours, and discreetly putting every one in its proper place. carses introduced and the last to branch desired to the Back.

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The protect you lay them on, the evener and bleaned

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when you have done, your work, or would say it alides.

be careful to wall our your pencils in water waters an

For Excaspanting, mix up a little tipot Carnarions

ner topether, and fordship riay one, addite

least colours from dult; and before you use them, no roun bhells. VX PagerevHyJime with a fitch as

bases and the Lead state of the Co.

I MNING is the art of painting in Water. Colours, in contradiction to Painting, properly fo called, which is done in Oil Colours. In Limining, all colours are proper enough, excepting the White made of Lime, which is only used in Fresco, but the Azure and Ultramarine must always be mixed up with Size or with Gum; because the Yolks of Eggs give Yellow colours a greenish tincture. The colours are all ground in Water, each by itself; and in proportion as they are wanted in working, are diluted with fized Water. The great advantage of Limning consists in its being free from any lustre, in regard that all its colours, thus void of lustre, may be seen in all kinds of lights; which in Oil, or covered with Varnish, cannot.

Directions for using the Colours.

Your Pencils must be fast in their quills, and sharppointed after you have drawn them through your mouth. Before you begin, have all your colours ready before you, and a Pallet for the conveniency of mixing them; a paper to lay under your hand, and to keep your work clean; as well as to try your colours upon; also a large brush called a Fitch, to wipe off the dust when your colours are dry.

Lay your colours on but thinly at first, deepening and mellowing them by degrees as you see occasion.

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the quicker you lay them on, the evener and cleangyour Drawing will appear: take care to preferve your colours from dust; and before you use them, wipe your Shells and Pallet every time with a fitch: when you have done your work, or would lay it aside, e careful to wash out your pencils in warm water.

For Face painting, mix up a little light Carnation r Flesh colour with Gum water in a shell by itself, if the for a fair complexion, mix a little Vermillion and White Flake together; and for a swarthy one, add to the former a little Massicote or English Oker, or both. Let your Flesh colour be always lighter than the emplexion you would paint, for by working on it. wu may bring it to its true colour. In a large shell, g upon your Pallet, lay your different shades of Helh colour at a convenient distance from each oter; and always have ready a sussicient quantity of white to lighten your shadows.

The For the Cheeks and Lips, use a mixture of Lake and red Lead, or Carmine, as occasion requires; and

distribute tints (as under the Eyes, and in Veins) Inligo or Ultramarine and White: for Grey faint shaline lows, use White, English Oker, sometimes Massicote:
may be deep shadows, White, English Oker, Umber: for
larker shadows, Lake and Pink, which makes a good
ligh shadow.

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Let the person you are to Limn be posited in the pollure that he himself shall chuse, level with you, ud not more than fix yards from you at most. Oblerve the person's motion, if ever so small; for the

leave the person's motion, if ever so small; for the carp least motion amiss, if not recalled, will insensibly lead you into many errors. For your further instructions in Face painting, we refer you to the subject on Drawing.

In colouring Landscapes, at first only lay dead common ours smooth all over the piece, leaving no part untowered; and be not over curious in this part of the performance, but rather use a masterly freedom; and the work, though seemingly rough to the eye, will have a good effect when placed at a distance. Let

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not the roughness of the colour discourage you, for it is easily to be softened by degrees with the other shadow, observing only to sweeten and heighten them according as the light falls. In some places lay on strong touches, and in those places bring your work up together to an equal roundness and strength, tempering and sweetening your colours with a sharper pencil than the first, that no lumps or harsh edges be left; but that all your shadows may lie dispersed, soft, and smooth, gliding gently, as it were into one another.

You are not to finish any part before the other, but work up all the parts gradually alike till you see nothing wanting to complete your picture. Having laid your dead colours, begin with the lightest parts, as the Sky, Sun beams, &c. then the yellowish beams (which are to be done with Massicote and White,) next the blueness of the Sky, with Ultramarine or Smalt alone; for purple Clouds, only mix Lake and White, making your colours deeper as they go upwards from the horizon, except in tempestuous skies. The tops of distant Mountains must be worked so faint, that they may seem to lose themselves in the air.

Bring your colours forward as your distance decreases; painting your first ground next the horizon downwards of a bluish Sea-green, and as you advance forwards of a reddish or darker Green, till you come to the foreground itself, which, as it is to be the darkest part of all, do with dark Green, shaded with a dark Brown or Yellow; which rule of shadowing will also serve for the Trees on each respective ground. All distant objects are to be made imperfect as they appear to the eye, as has been already observed under the article of Light and Shade.

In colouring Trees, Boughs, and Branches, touch in all the dark shades first, raising the lighter leaves above the darker by adding Masticote to the dark Green, which may be made with Bice, Pink, and Indigo, for the uppermost of all, which are to be done

of : touch lightly the extremities of the leaves with little Green, Masticote, and White, and let off the brkest shadows with Sop green and Indico. These ples are adapted to general appearances; but the larner may deviate from them as Nature shall dicinte: League of the fee apparence leave and of radioscal que

With regard to Brapery, Fruits, Flowers, and oher branches of Painting, the best observations are be taken from the objects themselves, or the most prious and exact representations of them. Lastly, we would rather recommend to those who chuse to mint in Water Colours (chiefly for amusement) to by their Pencils and Colours prepared at the Cobur-shops; and such as will prepare them themlelves, we refer to Colours in particular.

A Method of Fresco Painting, or rather Plaistering on Walls, to endure the Weather, and representing Birds, Beafts, Herbs, Fruits, &c. in Relief.

It is performed on fresh Plaister, or on a wall laid with Mortar not yet dry, and with Water Colours: The method of painting in Fresco is as follows:

The plaister must be made of well washed Lime nixed with fine powder of old rubbish Stones; the ime must be so often wathed, till all its falt is exmeted, and all the work must be done in clear dry weather; or it may be mixed well with Flints thooughly burnt. And, in order to render the plaister hore durable, they strike into the joints of the brick flone wall, flumps of horse nails at about fix inchdistance from each other, to prevent the plaister om peeling off. With this plaister the wall is first be plaistered, a good thickness, and left some time dry; the defign and colours being first ready prepared.

This painting is chiefly performed on walls and

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vaults, newly plaistered with lime and sand; but plaister must only be laid on, in proportion as the painting goes on, no more being to be done at once than the painter can dispatch in a day, while it is moist. Before the painting is begun, there is usually a cartoon or design made of paper, to be chalked and transferred to the wall, about a quarter of an hour after the plaister has been laid on. The colour being prepared and mingled, the wall is to be plaistered over again the second time, about the thickness of half a crown; but only so much as you intend presently to work upon, and while it is wet, you must work the colours therein, which will mix and incorporate with the plaister, so as never to wash out.

The painting must be, for the work to come in all its beauty, wrought quick, and with a free hand; for there can be no mending or alteration after the first painting, and therefore make your colour high enough at first; yet you may deepen, but not easily lighten; nor must they ever be retouched dry, with colours mixed up with the white of an Egg, Size, or Gum, as some workmen do, by reason that such colours grow blackish; nor do any preserve themselves but such as were laid on hastily at first. In this painting all the compound and artificial colours and almost all the minerals, are set aside, and searce any thing used but earth's; which are capable of preserving their colour, defending it from the burning of the lime, and resisting its salts.

The colours used are White, made of Lime slack ed long ago, and white Marble dust, Oker, both sed and yellow, Violet, red Verditer, Lapis Lazuli, Black Spanish Brown, Spanish White, &c. all which are only ground, and worked up with Lime-water, Milk or Whey; and most of them go w brighter and

brighter as the Fresco dries.

The brushes and pencils for this work must be long and fast, or else they will rake and raise the painting. The colours must be full and slowing from the brush the design persect in the image or paper copy, for it

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this work you cannot alter or add upon any colour. This fort of painting has a great advantage, by it incorporating with the mortar, and drying along with it; it is rendered extremely durable, and never fails nor falls, but along with it. Before the painter begins his work he must prepare all the chief tints, and put them into separate pots; then try the colours on a dry smooth tile, for the tile presently imbibing all that is moist in them, and drying them, they see by it what effect they will have when used.

CHAP. XVI.

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GILDING is the art of spreading or covering any thing over with Gold, either in Leaf or uch GILDING is the art of spreading or covering em. In Liquid. There are several methods of Gilding in urs we amongst us, as Gilding in Water, Gilding in Oil, area Gilding by Fire, &c. pre- on lo slds

he burning gain The Method of Water Gilding.

with smill to a Water Gilding requires more preparation than that of Oil, and is chiefly on wooden works, and those made of Stuc, and these too must be sheltered from the weather. A fize is used for this way of gilding, made of threads, &c. of Parchment, or Gloves, boiled in water, to the confishence of a jelly. If the thing to be gilt be of wood, it is first washed with this fize, boiling hot, and then fet to dry; and afterwards with White paint, mixed up with the fame fize: some use Spanish White for this purpose, and

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others Plaister of Paris, well beaten and fifted: this fize paint must be said on with a stiff brush; which is to be repeated seldom or oftener, according to the nature of the work, as ten or twelve times in slat or smooth works; but seven or eight will be sufficient in pieces of Sculpture: in the former case they are applied by drawing the brush over the work, in the latter by daubing it.

When the whole is dry, they moisten it with fair water, and rub it over with feveral pieces of coarfe linen, if it be on the flat; if not, they beat or switch it with several flips of the same linen tied to a little flick, to make it follow and enter all the cavities and depressures thereof. Having thus finished the White the next thing to be done is to colour it with yellow Oker; but if it be a piece of Sculpture in Relievo they first touch it up, and prepare the several parts which may have happened to have been disfigured by the small iron instruments, as gouges, chissels, &c the Oker used for this purpose must be well ground and fifted, and mixed up with the fize before men tioned. This colour is to be laid on hot; and it works of Sculpture, supplies the place of Gold which fometimes cannot be carried into all the de pressures and cavities of the Foilages and other orna ments. A lay is also applied over this Yellow, which ferves for the Ground on which the Gold is to be laid; this lay is usually composed of Armenian bole Bloodstone, Black Lead, and a little fat; to which fome add Soap and oil of Olives; others burnt Bread Biftre, Antimony, Glass of Tin, Butter, and Sugar candy.

These ingredients being all ground together with hot fize, three lays of this composition are applied upon the yellow, the one after the other has been dried; being cautious not to put any into the cavit of the work to hide the yellow. The brush used so

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this purpose must be a very soft one, and when the matter is become very dry, they go over it again with a stronger brush to rub it down, and take off the small grains that slick out, in order to facilitate the burnishing of the Gold.

To be prepared for gilding, you must have three birts of pencils; one to wet, another to touch up and amend, and a third to flatten; also a Gilding Cushion for spreading the leaves of Gold on, when aken out of the book; a Knife to cut them, and a Squirrel's tail fitted with a handle; or else a piece of ine fost stuff on a stick, to take them up and apply You are first to begin with wetting your pencils; by which the last lay laid on with water is moistened, the better to receive and retain the Gold. Then you are to lay the leaves of Gold on the Cushin, and if who'e, you must take up with the Squirm's tail: but if in pieces, with the other instrument, Knife wherewith they are cut, and lay and spread hem gently on the parts of the work you had moist. med before. If the leaves, as they frequently do. appen to crack or break in laying on, these breaches full be made up with small bits of leaves taken upin the repairing pencil, and the whole work is to esmoothed either with the same pencil, or another omething larger; the Gold being pressed into the ents, into which it could not be so easily carried by he Squirrel's tail.

The work having been thus far gilded, must be set of dry, in order to be either burnished or statted. burnishing is smoothing and polishing it with a burnishing tool, which is usually a Dog or Wolf's tooth, was Bloodstone sitted into a handle for that purpose. Flatting it is giving it a light lick in the places not writished, with a pencil dipped in Size, in which a sittle Vermilion sometimes has been mixed: This tives to preserve and prevent its slawing when handed. The last operation is applying the Vermeil in all the little lines and cavities, and to stop and amend my little saults with shell Gold. The composition

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called Vermil is made of Gum Guttac, Vermilion and a fittle of fome ruddy brown colour, ground to gether, with Venetian Varnish and Oil of Turpen. tine. Some Gilders instead of this, make shift with fine Lucca or Dragon's Blood with Gum-water Sometimes instead of burnishing the Gold, they burn nilh the Ground of composition said on the last before it, and only afterwards wash the part over with the Size. This method is chiefly practifed for the Hands, Face, and other nudities in Relievo; which, by this mean, do not appear so very brilliant as the parts burnished, though much more fo than the parts perfectly flat. To gild a piece of work, and yet preferve white grounds, they apply a lay of Spanish White mixed with a weak fifth glue on all the parts of the ground, whereon the yellow or the last lay might run.

The Method of gilding in Oil. ath and burn

This operation requires much less apparatus than that before mentioned. The basis, or matter where on the Gold is laid, in this method, is the remains o colours found fettled to the bottom of the pots in which painters wash their pencils, This matte which is very vicid or flicky, is first ground, and then passed through a linen cloth: and thus laid with a pencil on the matter to be gilded, after it has been washed once or twice over with Size; and if it be wood, with some white paint: when this is almost dry, but yet is still uncluous enough to catch and re tain the Gold, the leaf Gold is laid on; either whole if the work be large, or cut to pieces if smaller; the leaves of Gold are taken up and laid on with a piece of fine, foft, well carded cotton; or sometimes by pallet for the purpose, or sometimes with the knist prowith which the leaves were cut, according to the parts of the work that are to be gilded, or the take breadth of the Gold that is to be laid on. As the Am fold is laid on, they pass over it a coarse stiff pencil, brush to make it stick, and, as it were, incorporate with the ground; and after this, they mend any tracks that may have happened in it, either with the ime pencilor one that is smaller; as has been shewn before in Water Gilding. This kind of Gilding is chiefly used for domes and roofs of Churches, Courts, Banquet-houses, &c. and for figures of plaister of Paris, Lead, &c.

The Method of gilding with Liquid Gold.

This is performed by Gold reduced to a Calx and amalgamated with Mercury, in the proportion of about an ounce of Mercury to a drachm of Gold, To perform this, they heat a crucible red hot, and then put the Gold and Mercury into it, stirring them gentwabout till the Gold be found melted, and incorporated into a mass with the Mercury. When this s done, they cast them into water to wash and purifithem, and out of that into other waters, where the Amalgama, which is almost as liquid as if there were nothing but Quickfilver in it, may be preserved long time for use. Before they proceed to lay this amalgamated gold on the metal, they first render the metal rough, by washing it over with Aqua Fortis or Aqua- secunda; and afterwards rinse the metal in fair been water, and fcour it a little with fine Sand, and then it be it is ready for the Gold: then they cover over the most metal with the mixture of Gold and Mercury, taking d re it up with a flip of Copper, or brush made of Brass hole wire, spreading it as even as possible, to do which they the wet the brush from time to time in fair water; then piece they set the metal to the fire upon a grate in a sort of by: orge, under which stands a pan of coals; and in knife proportion as the Mercury evaporating and skring off proportion as the Mercury evaporating and flying off discovers the places where the Gold is wanting, they take care to supply them by adding new parcels of s th Amalgama. Then the work is rubbed over with the

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wire brush dipped in Beer or Vinegar, which leaves it in a condition to be brought to a colour, which is the last part of the process; and which the Gilders keep to themselves as a mighty secret; though it is certain it cannot differ much from the manner of giving Gold species their colour in coining.

To gild GLASS.

Take Chalk and Red Lead, of each a like quantity, grind them together, and temper with Lintfeed oil; lay it on, and when it is almost dry, lay leaf Gold on; let it dry, and then polish it.

To gild IRON.

Take one pound of liquid Varnish, Lintseed-oil, and Turpentine, of each one ounce; mix them well together, strike them over any metal, and afterwards lay on leaf Gold or Silver, and when it is dry polish it.

To gild SILVER, BRASS, or COPPER, with GOLD-WATER.

Take two ounces of Quickfilver, put it into a crucible, fet it on the fire, and when it begins to smoak; put in an Angel of fine Gold; then take it off immediately, for the Gold will be presently dissolved; then, if it be too thin, strain a part of the Quickfilver from it through a piece of Fustian: when you have done this, rub the Gold and Quickfilver upon Brass or Silver, and it will cleave to it; then put the said Brass or Silver upon quick coals, till it begins to smoak; then take it from the fire, and scratch it with a hair brush; this do till all the Mercury is rubbed as clean off as may be, and the Gold appears of a faint yellow; then heighten the colour with Sal Ar-

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You must take notice, that before you gild upon metal, you must boil it in Tartar, or Beer and water.

To gild on WOOD or STONE.

Take Bole Armoniac and Oil of Ben, of each a fufscient quantity: beat and grind them together, and smear the Wood or Stone, and, when it is almost dry, by on leaf Gold, let it dry, and polish it.

To Silver any METAL.

Dissolve fine Silver in strong Aqua Fortis, and put in as much Tartar finely powdered as will make it into a paste; with which rub any metal, and it will book like fine Silver.

CHAP. XVII.

toylidade Of ETCHING.

TCHING is a method of working on Copper, wherein the lines or strokes, instead of being cut with a Graver, are eaten with Aqua Fortis.

This art, being executed with greater ease and freedom than Engraving, represents curious subjects letter, and more agreeable to Nature, as Landskapes,

Ruins, and small, faint, or remote Objects, Build-

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The principal Materials for this art are the Plate, hard and foft ground, (the first for winter, and the other for summer,) a dauber, Turpentine, Varnish, Lamp Black, foft Wax, and Aqua Fortis.

The Tools are, an Oil Rubber, a Burnisher, a Scraper, a-Hand-Vice, Etching-Boards, Etching-Needles.

an Oil-Stone, and a Parallel Ruler.

Directions for laying the Ground.

Having provided yourfelf with a plate of the fize of the print or drawing you intend to copy, rub it well with an oil-rubber made of swan-skin flannel, till all the marks of the charcoal used in polishing it entirely disappear; then, wiping off the dirty oil, with a linen rag, dip your finger in fome clean oil, and touch it over every part of the plate; after which, with your burnisher, polish the plate, till you can see your face in it. And in case any sand-holes or flaws appear, the scraper will affift you in taking them out. The marks left by the scraper are to be taken out with the burnisher, till nothing appear. Having fixed your hand-vice at one end of the plate, with a rag and whiting clear the plate carefully from greafe; then heat it over a charcoal fire, or lighted paper, till it will melt the ground, which is to be laid on thinly, and dabbed all over with the dabber, till it is perfeetly smooth and even; then warm the plate again, and holding it up with the ground downwards, fmoak it all over with a large candle, taking care that the fnuff do not touch the ground, and waving the candle continually over every part, fo that the ground may not be burnt by heating it more in one place than another. If the plate be large you may join four penny candles together. may do mathlen

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Directions for Tracing.

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The first thing to be done, (while the plate is cooling, after the ground is laid) is to rub the back of your print or drawing all over with a bit of clean ng or cotton, dipt in the scrapings of red chalk, and hake off the loose dust, or wipe it off gently with a clean ng. Place the red side upon the plate, making it fast at each corner with a bit of soft wax.—Lay your etching board under your hand, to prevent bruising the ground; then with a blunt etching needle trace lightly the out-lines and breadths of the shadows, till the marks of them appear upon the ground, which you must take care not to penetrate by tracing too hard.

As great nicety is required in this part of your work it will be necessary now and then to lift up me part of your original, and examine whether every part be traced before you take it off, as it will be extremely disticult to lay it down again in its former position.

Directions for Etching.

Having carefully traced your original, take it off, and lay a filk or linen handkerchief next the plate, and over that your etching-board; then proceed to the etching: for which observe the following directions, which are adapted to every particular branch, as landskapes, shipping, portraits, history, architecture, &c.

Distances in Landskapes, or the faint parts of any other picture, are the first to be done; and these are to be worked closer, and with a sharper pointed needle: The darker parts must be etched wider, and with a blunter needle; but to prevent mistakes, the needles may be marked, according to their different degrees, and the uses for which they are intended.

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As for the very faintest parts of all, they are to be left for the graver, or dry needle; of which here. after.

In building, and all architecture in general, use a parallel ruler, till frequent practice enables you to do

them well enough without it,

The needles when necessary, must be whetted up. on your oil-stone, keeping them turning in your hand, so as to whet them equally all round. The oil stone will be farther useful in whetting the scraper, which is to be rubbed slat upon the stone, and with a steady hand, keeping oil constantly upon the stone.

Of biting or eating in the Work with Aqua Fortis.

First examine your work carefully, to see that nothing be omitted; and if any scratches appear upon the ground, or mistakes be committed in the etching, they are to be stopped out, which is done by covering them with a mixture of lamp-black and varnish, laid on thinly with a hair pencil, which, when dry, will resist the Aqua Fortis. But it will be best to stop out these, as they occur to you in the course of your work, for by this mean they will be less liable to escape your notice; and when the varnish is dry you may etch it over again, if required.

The next thing is, to enclose the work with a rim or border of foft green, or other coloured wax, about half an inch high, bending the wax in the form of a spout at one corner, to pour off the Aqua Fortis: And that is may not run out at any other part, take care to lay your wax so close to the plate, that

no vacancies be left.

Your Aqua Fortis must be single, and if too strong, which will be seen in the biting, take it off, and mix it with a little water, shaking them together in a bottle; and when, by often using, it becomes too

reak, it may be strengthened by mixing it in a botthe with a little double Aqua Fortis. The bottle which contains the Aqua Fortis should have a large mouth, and a glass fropple,

Let the Aqua Fortis lie on the plate a short time, wiping off the bubbles, as they artie, with a feather, which may remain upon the plate while it is biting; after which take it off, and wash the plate with water; then let it dry, and by scraping off part of the gound from the faintest part of the work, try if it be bit enough; and if not, stop out the part you have tried with the lamp-black and varnish; and when that part is dry, pour on the Aqua Fortis a-

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When the faint parts of your work are bit enough, lop them out, and proceed to bite the stronger parts, hopping them out as occasion requires, till the whole work is fufficiently bit: Then warm the plate, and ake off the foft wax; after which, heat the plate fill the ground melts, pour on a little oil, and wipe the whole off with a rag. When the ground is taken off, rub the whole work well with the oil-rubher, and wipe the plate clean; then proceed to finish twith the graver, according to the following directions.

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on is done, in order to whet the face, place

and tab the extremative of face upon the

that has an exceeding that point, which yer

upon your thumb nail. The off-flone, while Of ENGRAVING.

THE tools necessary for engraving are, the Oilrubber, Burnisher, Scraper, Oil-stone, Needles. and Ruler, already mentioned to be used in etching;

also gravers, compasses, and a fand bag.

Gravers are of two forts, square and lozenge; three of each fort should be provided. The first is used in cutting the broader strokes, the other for the fainter and more delicate. No graver should exceed the length of five inches and a half, the handle in cluded, excepting for strait lines.

The fand-bag or cushion, is used to lay the plate on, for the conveniency of turning it about. The

Oil-stone must be of the Turkey fort.

Of pointing the Graver.

As great pains are required to whet the grave nicely, particularly the belly of it, care must be ta ken to lay the two angles of the graver, which are to be held next the plate, flat upon the stone, and rub them steadily till they are polished like a mirror and till the belly rifes gradually above the plate, fo that when you lay the graver flat upon it, you may just perceive the light under the point; otherwise i will dig into the copper, and it will be impossible to keep a point, or execute the work with freedom. It order to this, keep your right arm close to your fide

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ween ou f and place the forefinger of your left hand upon that part of the graver which lies uppermost on the stone. When this is done, in order to whet the face, place the slat part of the handle in the hollow of your hand, with the belly of the graver upwards, upon a moderate slope, and rub the extremity or face upon the stone till it has an exceeding sharp point, which you may try upon your thumb nail. The oil-stone, while in use, must never be kept without oil.

When the graver is too hard, as is usually the case when first bought, and may be known by the frequent breaking of the point, the method of temper-

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Heat a poker red hot, and hold the graver upon it within a little of the point, waving it to and fro till the steel changes to a light straw colour; then put the point into oil to cool; or hold the graver close to the stame of a candle, till it be of the same colour, and cool it in the tallow: But be careful either way not to hold it too long, for then it will be too soft; and in this case the point, which will then turn blue, must be broken off, and whetted afresh, and be tempered again if required. But be not too hasty in tempering; for sometimes a little tempering will bring it to a good condition.

Of holding the Graver.

Cut off that part of the handle which is upon the ame line with the belly, or sharp edge of the grater, making that side slat that it may be no obstruction.

Hold the handle in the hollow of your hand; and attending your fore-finger towards the point, let it the upon the back of your graver, that you may guide that, and parrallel with the plate.

Take care that your fingers do not interpose beween the plate and the graver, for they will prevent ou from carrying the graver level with the plate,

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Let the table or board you work at be firm and fleady; upon which place your fand bag with the plate upon it; and holding the graver as above directed, proceed to business in the following manner.

For strait strokes, hold your plate firm upon the fand-bag with your left hand, moving your right hand forwards; leaning lighter where the stroke should be fine, and harder where you should have it broader.

For circular or crooked flrokes, hold the grave fledfast, moving your hand or the plate as you see convenient.

Learn to carry your hand with such a slight, that you may end your stroke as finely as you began it; and if you have occasion to make one part deeper of blacker than another, do it by degrees: And that you may do it with greater exactness, take care that

your strekes be not too close, nor too wide.

In the course of your work, scrape off the barbor roughness which arises, with the belly of your graver; but be careful in doing this, not to scratch the plate: And that you may see your work properly as you go on rub it with the oil-rubber, and wipe the plate clean, which will take off the glare of the copper, and shew what you have done to the best advantage.

Any mistakes or scratches in the plate may be rubbed out with the burnisher, and the part levelled with the scraper, polishing it again afterwards lightly with

the burnisher.

Having thus attained the use of the graver according to the foregoing rules, you will be able to finish the piece you had etched, by graving up the several parts to the colour of the original; beginning, as in

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Etching, in the faintest parts, and advancing gradually with the stronger, till the whole is completed.

The dry needle (so called because not used till the ground is taken off the plate) is principally employed in the extreme light parts of water, sky, drapery, architecture, &c.

For your first practice, copy such prints as are openly shaded; the more finished ones being too dif-

foult, till you have gained farther experience.

To prevent any obstruction from too great a degree of light, we would recommend the use of a sash, made of transparent san-paper, pasted on a frame, and placed sloping at a convenient distance between your work and the light. This will not only preserve the sight, but, when the sun shines, cannot possibly be dispensed with.

CHAP. XIX.

Of MEZZOTINTO-SCRAPING.

THIS art, which is of late date, is recommended to the practice of the ingenious reader, for the amazing ease with which it is executed, especially by those who have any notion of drawing.

Mezzotinto Prints are those which have no Hatching or Strokes of the Graver, but whose Lights and Shades are blended together, and appear like a

Drawing of Indian Ink.

The Tools used in this Art are,

258 The SCHOOL of WISDOM, or,

The Copper-Plate, Oil-Stone, Grounding-Tools, Scrapers, Burnisher, and Needles.

Directions for laying the Mezzotinto-Ground.

Opedions for scraping the Lieune

Mark of upon the bottom of the plate the distance you intend to leave for the writing, coat of arms, &c. then, laying your plate with a piece of Swan. Ikin flannel under it, upon your table, hold the grounding tool in your hand perpendicularly, lean upon it moderately hard, continually rocking your hand in a right line from end to end, till you have wholly covered the plate in one direction; Next cross the strokes from fide to fide, afterwards from corner to corner, working the tool each time all over the plate, in every direction, almost like the points of a compass; taking all possible care not to let the tool cut (in one direction) twice in a place. This done, the plate will be full, or, in other words, all over rough alike, and would, if it were printed, appear completely black.

Having laid the ground, take the scrapings of black chalk, and with a piece of rag rub it over the plate; or you may, with two or three candles, smoak it, as

before directed for Etching.

Now, take your Print or Drawing, and having rubbed the back with red Chalk Dust, mixed with White Lake, proceed to trace it as directed.

Direction's for whetting the Grounding-Tool.

If a tooth of the tool should break, it may be perceived in the working by a particular streak or gap which will appear in the ground in a strait line; in which case the tool must be whetted on the back holding it sloping, and in a circular manner, like the bottom of the tool. ther of the port takin may fore

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Directions for scraping the Picture.

apers, Barniner, and Needles.

Take a blunt needle, and mark the outlines only, then with a scraper, serape off the lights in every part of the plate, as clean and smooth as possible, in proportion to the strength of the lights in your picture, taking care not to hurt your outlines: and that you may the better see what you do, with the thumb and sore-singer of the lest hand hold a piece of transparent paper, sloping, just over your right hand, and you will soon be a judge of the different tints of the work you are doing; scraping off more or less of the ground, as the different strengths of light and tints require.

The use of the Burnisher is, to soften or rub down the extreme light parts after the scraper is done with, such as the tip of the nose, forehead, linen, &c. which might otherwise, when proved, appear rather misty than clear.

Another method used by Mezzotinto-Scrapers is, to etch the outlines of the original, as also of the solds in drapery, marking the breadth of the shadows by dots, which having a bit of a proper colour with Aqua Fortis, according to the directions given and taken of the ground used in etching, and having laid the Mezzotinto-Ground, proceed to scrape the picture as before directed.

Four or five days before you think the plate will be ready for proving, notice must be given to the solling-press printer, to wet some French paper, as no other will do for this work, and as that time is necessary for it to lie in wet. When the proof is dry, touch it with White Chalk where it should be lighter, and with Black Chalk where it should be darker; and when the print is retouched, proceed as before for the lights; and for the shades use a small grounding-tool, as much as you judge necessary to

bring it to the proper colour; and when you have done as much as you think expedient, prove it again and so proceed to prove, and touch, till it is entirely to your mind. When the plate tarnishes in the par where you are at work, a little vinegar and salt kep by you in a Phial will take it off, wiping it dry with a clean rag.

Avoid as much as possible over-scraping any part before the first proving, as by this caution the work

will appear the more elegant.

CHAP. XX.

PAINTING upon GLASS.

PAINTING upon GLASS is an art which has generally appeared difficult; yet there is no representation can be more elegant than that of a picture done well in this manner; for it gives all the softness that can be desired, and is easy to work; as there are no outlines to draw, nor any shade to make; but the colours are put on without the trouble of either.

The pictures are those done in Mezzotinto; for their shades being rubbed down on the glass, the several lines which represent the shady part of any common print, are by this mean blended together, and appears as soft and united as in any drawing of

Indian Ink.

Provide such mezzotintos as you like; cut off the

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margin; then get a piece of fine crown glass, the fize of your print, (as flat and free from knots or tratches as possible) clean the glass, and lay some Venice Turpentine, quite thin and smooth, on one ide thereof, with a brush of hog's hair. Lay the mint flat in water, and let it remain on the furface ill it finks; 'tis then enough: take it carefully out, and dab it between some papers, that no water may be feen, yet fo as to be damp.

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Next, lay the damp print, with its face uppermoft, upon a flat table; then, holding the glass over it, without touching the turpentine till it is exactly even with the print, let it fall gently on it. Press the glafs down carefully with your finger in feveral parts, that the turpentine may flick to the print; after which, take it up; then, holding the glass towards ou, press the print with your fingers, from the cener towards the edges, till there be no blifters remaining.

When this is done, wet the back of your print with a spunge, till the paper will rub off with your ingers; then rub it gently, and the white paper will foll off, leaving the impression only upon the glass: then let it dry, and with a Camel's hair pencil, dipt in oil of turpentine, wet it all ever, and it will be

moil of turpentine, wet it all over, and perfectly transparent, and fit for painting.

Colours proper for painting upon Glass.

Whites.

Reds.

for Flake White. e se- Spodium.

Rose Pink. Vermillion. Red Lead

Blacks.

Indian Red.

Lamp Black. f the Ivory Black. Lake Cinnabar.

pant, and the darker over the faciled parts a and his

made to Browns. a bial one et English Pink. it land

Spanish Brown. Masticot
Umber English Oker.
Spruce Oker Saunders Blue.
Dutch Pink. Smalt.
Orpiment.

Blues.

Blue Bice. Prussian Blue Greens.

Verdigreafe. Terra Vert. Verditer.

The ultramarine (for Blue) and the carmine (for Red) are rather to be bought in powders, as in that case they are less apt to dry, or be lost: And as the least touch of these will give the picture a cast, mix up what you want for present use with a drop or two of nut oil upon your pallet, with your pallet-knise.

To get the colour out of the bladders, prick a hole at the bottom of each, and press it till you have enough upon your pallet for present use; because the

colours are apt to dry and fkin over.

Then lay a sheet of white paper on the table, and taking the picture in your left hand, with the turpentine side next you, hold it sloping (the bottom resting on the white paper) and all the outlines and tints of the print will be seen on the glass; and nothing remains but to lay on the colours proper for the different parts as follows.

The Method of using the Colours.

As the lights and shades of your picture open, lay the lighter colours first on the lighter parts of your

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print, and the darker over the shaded parts; and having once laid on the brighter colours, it is not material if the darker sorts are laid a little over them; for the first colour will hide those laid on afterwards, as for example.

alama Reds.

Lay on first the red lead, and shade with lake or

Yellows.

The lightest Yellow laid on first, may be shaded with Dutch Pink.

Blues.

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Blue Bice or Ultramarine, used for the lights, may

slot a song stolens Greens.

Lay on Verdegrease first, and then a mixture of hat and Dutch Pink. This Green may be lightened by an addition of Dutch Pink.

I bosses the bettom

bWhen any of these colours are too strong, they may be lightened to any degree, by mixing White with them upon your pallet: or you may darken them as much as you please, by mixing them with a steeper shade of the same colour.

The colours must not be laid on too thick; but if mublesome, thin them before you use them, with slittle Turpentine-oil.

Take care to have a pencil for each colour; and ever use that which you have used for Green with my other colour, without first washing it well with

Turpentine-oil, as that colour is apt to appear predominant when the colours are dry.

Wash all the pencils after using in Turpentine-

Your Glass, when painted, must stand three or four days free from dust, before it be framed.

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CHAP. XXI.

Of BRONZING.

BRONZING is colouring by incurrence to plaister, or other busts and figures, in order to make them appear as if cast of copper or other me tals.

This is fometimes done by means of cement; and fometimes without, in the instance of plaister figures but the Bronzing is more durable and fecure when

Gold powders, and aurum Mosaicum, are frequent other ly employed for this purpose; but the proper bron scale grant of the proper grant of the grant

Take filings of copper, or flips of copper-plates prud

and dissolve them in any kind of Aqua Fortis pu gind into a glass receiver, or other proper formal vertion fel.—When the Aqua Fortis is saturated with the with

copper take out the flips of the plates; or, if fil pipe

lings were used, pout off the solution from what remains undiffolved; and put into it small bars of iron; which will precipitate the copper from the Aqua Fortis in a powder of the proper appearance and colour of copper. Pour off the water then from the powder; and wash it clean from the salts, by feveral successive quantities of fresh water.'

The aurum Mefaicum, which is tin-coloured, and endered of a flasky or pulverine texture, by a chemical process, so as greatly to resemble gold powder,

prepared in the following manner:

y the mount its winding come medial scatt

' Take of tin one pound, of flowers of fulphur feven ounces, and of Sal Ammoniacus and purified quickfilver each half a pound -Melt the tin; and add the quickfilver to it in that state: and when the mixture is become cold, powder it, and grind it with the Sal Ammoniacus and sulphur, till the whole be thoroughly commixt. Calcine them in a mattrass; and the other ingredients subliming; the tin will be converted into the aurum Mosaicum, and will be found in the bottom of the glass like a mass of bright flacky gold powder: but if any black or discoloured parts appear on it, they must be carefully pickt or cut out."

The method of making the filver powders is also te same as those of gold, except with regard to one the German powders, which is correspondent bron foolour, to the aurum Mosaicum or musivum: whence more has been indeed, though improperly, called the duce gentum musivum. The process for this being, therewither, different from the above, it is proper to insert remainstrate, as follows:

' Take of very pure tin one pound ; put it into a dates crucible, and fet it on a fire to melt: when it betis pu gins to run into fusion, add to it an equal proportion of bismuth, or tin glass; and stir the mixture
th th with an iron rod, or the small end of a tobaccoif sil pipe, till the whole be entirely melted and incor-

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porated. Take the crucible then from the fire; and, after the melted composition is become a little cooler, but while it is yet in a fluid state, pour into · it a pound of quickfilver gradually; stirring it in the mean time, that the mercury may be thorough-' ly conjoined with the other ingredients. When the whole is thus commixt, pour the mass out of the crucible on a stone; where, as it cools, it will make the form of an almalgama or metalline paste: which will be easily bruised into a flaky powder; and is then fit for use.

Where the appearance of brafs is defigned, the gold powders, or the aurum Mosaicum, may be mixt with a little of the powder called argentum musivum; of which the preparation is before given.

Where the appearance of filver is wanted, the argentum musevum is the best and cheapest method: particularly, as it will hold its colour much longer than the true filver used either in leaf or powder.

Where no cement is used in bronzing, the powder must be rubbed on the subject intended to be The bronzed, by means of a piece of fost leather, or fine infinence rag, till the whole furface be coloured.

The former method of using a cement in bronz- poses ing was, to mix the powders with strong gum-water why s

or isinglass fize; and then with a brush, or pencil vay, to lay them on the subject. But at present some use the japanners gold fize; and proceed in all respects the japanners gold fize; and proceed in all respects the in the same manner as in gilding with the powder in other cases: the fize is made as follows:

'Take of Lintseed oil one pound, and of gum as the powder of the vessel; and then add the gum animi gradually in the vessel; and then add the gum animi gradually in the powder; stirring each quantity about in the oil to remain the first another, till the whole be commixt with the oil

another, till the whole be commixt with the oil

Let the mixture continue to boil, till, on taking

fmall quantity out, it appear of a thicker confile

a course cloth, and keep it for use. But when i

is wanted, it must be ground with as much vermithion as will give it an opake body; and at the fame time diluted with oil of turpentine, fo as to render it of a confiftence proper for working freely with

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ime, that the mercury may Llianaq aft) This is the best method hitherto practised. he japanners gold fize binds the powders to the round, without the least hazard of peeling or falling of; which is liable to happen when the gum water or glovers, or ifinglass fizes are used. Though, notwithstanding the old practice for the contrary, even hele cements will much better secure them when they are laid on the ground, and the powders rubbed over them, than when both are mixed together, and the effect, particularly of the aurum Mofaicum, will e much better in this way than the other. old fize should be suffered, in this case, to approach much nearer to dryness than is proper in the case of ilding with leaf gold, as the powders would otherwife be rubbed amongst it in the laying on.

The fictitious filver powder, called the argentum mylvum, may, as before mentioned, be applied in he manner of bronze, by those whose caprices difples them to filver figures or bufts. But it is the ter mly fort of filver powder that should be used in the only fort of filver powder that should be used in this cil may, for the reasons before given; and all such kind following is much better omitted. For the whitede les itself of plaister in figures or busts, and much er more a gloffy or thining whiteness, is injurious to beir right effect; by its eluding the judgment of the a ye, with respect to the proper form and proportion pe of the parts, from the false and pointed reslections y it is the lights, and the too faint force of the shades. oil to remove which inconvenience it is probable was

g it he first inducement to bronzing.

in it was a super craft about the last the company of

citye. Then baying ready lime, prejuted as to capito die its HXX P. A.H. of the empty va ment a maneful or two of it, and afterwards pour all

they waster, and sape out the free four wader it

To the true from Dot Xerri Tol. No. C. olad 161 or lago to diffolive in a quart-or shipe pints of water, it

the ingradiciplicate of the keithe into it, and order a

the second of iron, or bigles, suppose half a handle The Method of making a Vat, and preparing hot Suds de of bestellig Linen and Woollen Blue. haratul ad opa form details and terms

ow to good state on the boar state band in it. I I AVING made a vat big enough to contain eight pails of water, wide at the top, and narrow at the bottom; feafon it for a day and night with hot water, and afterwards wash it out with cold; then cut a four square at about the height of twenty one inches, and fourteen broad; and have a copper plate made of the same thickness with the wood of the var; nail this upon the hole, placing the nails at the diflance of the breadth of two fingers one from the other; the nails must be small, with broad heads, to prevent its leaking; then place an iron hoop at the top, and another at the bottom of the copper: the hole must be made about a hand's breadth from the bottom of the vat. When this has been done, plaifler or brick it about, either leaving or making a hole in the plaister or brick work, wider at the utmost end, and a little narrower at that which comes to the copper itself; the shape of it being like an oven's mouth, that the wood be not injured, when the fire, to heat the vat of fuds, is put into this vacancy.

For every half pound of indigo you put in, in order to blue linen or woollen, take in eight pails of water, and into that fix handfuls of coarle wheaten bran, eight or nine ounces of madder, a pound and a half of pot ashes; pour them all into a copper to make suds, and, when the liquor boils so as to begin

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to swell and bubble up, throw in two or three quarts of cold water, and rake out the fire from under the copper. Then having ready lime, prepared as the tanners use it, plaister the inside of the empty vat with a handful or two of it, and afterwards pour all the ingredients out of the kettle into it, and cover it very close.

The day before you do this, you must put your indigo to dissolve in a quart or three pints of water, in a clean vessel of iron or brass, adding half a handful of wheaten bran, and half a handful of madder, and half an ounce of pot ashes, and leave it a whole night over a coal fire; but it must not be suffered to boil, or grow hotter, than you can bear your hand in it.

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You must also grind it with a pestle or iron ball fill it becomes as foft as pap, and is quite cleared of all roughness or harshness; which being done, it is fit to be put into the vat to the other ingredients. Then flir it about three or four times with a flick, cover it up close, and let it stand to settle fix hours; after which throw in a ladleful of lime dust, or powder, or of the same that you before plaistered the vat with, then cover it close again, and let it stand for three hours longer, and then put in half an ounce of pot ashes; stir it well about again, and put a coal fire in the hole before the copper plate, in order to keep it warm, and let it stand three hours longer; after which, nothing is to be added, only ftir it as before, and, in an hour or two after, you may dye with it as follows;

Hang five pieces of goods in it, keeping-the bran and flour, &c. from it with your hand, to prevent its touching the linen as much as possible; wring the five pieces out one against another, then try, by feeling with your finger, whether the dye be harsh, or soft and smooth; if it feels too rough, throw in half an ounce of pot ashes; and if it be too smooth, add a ladleful of lime. Work the cloth or linen in it for two hours, put in five fresh pieces, and work them like the former; and, when they are dry, wring

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them a second or third time in the dye, till they be.

Your dye may be wrought in this manner, till you have dyed thirty pieces; and afterwards, if you would dye any woollen ware, flockings, or yarn, take two pailfuls of water, into which put two handfuls of wheaten bran, an ounce of madder, and a quarter of a pound of pot affecs, and hang it over the fire and boil it to the fuds as before; then put it into the vat, and, after you have flirred it well about, let it fland to fettle three hours: then try with your finger whether it is harsh or smooth; if it be too harsh, add half an ounce of pot ashes; and, if too smooth, add half a ladleful of time, and stir it again.

A blue dye for Silks.

Procure a tub that may be close covered, put into it a ley made of three pailfuls of river or rain water, and clean beech ashes; put in also two handfuls of wheaten bran, two ounces of madder, two ounces of white wine tartar, and half a pound of indigo pounded small: fiir it very well with a flick every twelve hours, for fourteen days, till it tinges a fort of green, and when the dye is grown bright, it must be stirred every morning. Put the filk into a warm fresh lev, wring it out, and then stir it about in the dye some time afterwards, letting it hang in the dye, according to the custom of dying; and besides the blue copper, there ought to be another copper full of ley, that, when the filk is wrung out of the dye, it may be rinced in it; and, after it has been wrung very clean out of that, rince it again in river water, beat it and dry it. If the filk be moistened in this latter lev of suds, before it is dried, there is no need of the first above-mentioned lev.

Several forts of blue may be made with this dye, either brighter or darker, at pleasure, according to the time they are left in it; and, when the copper

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grows low, you may fill it up again out of the rincing vat; but when the blue copper or vat grows weaker, then put in a quarter of a pound of pounded indigo, and half a pound of pot asses, half an ounce of madder, a handful of wheaten bran, and a quarter of an ounce of tartar pounded; let it stand eight days without using it, slirring it every twelve hours, and then you may dye with it again as before.

Of dying Red colours.

Take lixivium of unflacked lime five gallons, brafil ground two pounds and a half, boil it to the half,
then put to it alum twenty ounces; keep it warm,
but not to boil: then what you would dye in this colour dip it into a ley made of ashes of tartar, letting
it dry, then dip it into the ley.

To dye a red blufb colour,

Take stale clear wheat bran liquor six days old, a sufficient quantity; alum three pounds and a half, red tartar half a pound; melt these, and enter twenty yards of broad cloth; handle and let it boil three hours, take it out and wash it well, but some wash it not: take fresh liquor a sufficient quantity, of the best madder three pounds; enter your cloth, and handle it to a boiling heat, cool and wash it again; lastly, take fresh bran liquor a sufficient quantity, enter your cloth, let it boil a quarter of an hour, cool and wash it well again.

To make a red blush colour in grain.

Take stale sour clear bran liquor, a sufficient quantity; alum three pounds and a half, red tartar half a pound; enter twenty yards of cloth, boil it three

hours, cool and wash it, take fresh clear bran liquor a proper quantity, best madder three pounds, enter and boil again: take fresh bran liquor a sufficient quantity, grains in sine powder four ounces, red tartar three ounces; enter your cloth, boil it an hour or more, keeping your cloth well under the liquor, then cool and wash it well.

mangu Ala A red rofe or carnation colour.

Take wheat bran liquor, a sufficient quantity, alum two pounds, tartar two ounces; boil and enter twenty yards of camblet or cloth, and boil it three hours, after which take it out, and wash it very well; then add madder a pound, enter and boil it again, cool and wash it; after which take clear liquor a sufficient quantity, cochineal in fine powder two ounces, tartar two ounces; enter your cloth, boil and finish it.

To die Silk red. dountes die

For every pound of filk put four handfuls of wheaten bran into the quantity of two pails of water; boil them together, and pour the liquor in a tub, and let it stand all night, clarify it, and put into the water half a pound of alum, and a quarter of a pound of tartar of red wine reduced to an impalpable powder; add also half an ounce of turmeric, reduced to a fine powder; boil them together for a quarter of an hour, flirring them very well; then take the kettle off the fire, and immediately put in the filk, and cover the kettle very close, that none of the steam may evaporate: let it stand thus for three hours, then take out the filk, and rince it very well in cold water: then beat it very well upon a block, and let it dry. Then beat a quarter of a pound of galls small, put them into a pail of river or rain water; boil them for a full

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hour, then take the kettle off the fire, and when it is grown cool enough for you to endure your hand in it, put in the filk, and let it lie and steep in it for an hour, then take it out and dry it. For every pound of filk allow one pound of brafil, boil it, and strain it; then boil the wood again, adding cold water to it; wave or turn the filk about in it, take it out of that without wringing, when it has sufficiently imbibed the tincture; then add a little pot asses, or put them into cold water, and turn the filk up and down in it, and when it is red enough rince and dry it.

To dye a very fine Crimfon.

with a reputation and the property of the property of the section of the section

For fixteen pounds of woollen stuffs boil twelve gallons of water, or rather more; to which put in fixteen handfulls of wheaten bran; let it fland a night to fettle, stirring it very well, and in the morning pour off the clear liquor, or rather firain it, that it may be perfectly clear: mix one half of this liquor with as much clean water, that the cloth or stuffs may be worked commodiously in it. Boil this mixed liquor, and put into it one pound of alum, and half a pound of tartar; boil these very well, and then put in the goods and boil them for two hours, keeping them stirring (especially if they are made of wool) from top to bottom continually, to finish it. Boil the remainder of the bran and water with an equal quantity or, rather more, of fair water, and when it boils space, put in four ounces of cochineal, and two ounces of pure white tartar powdered; flirring it about, and taking care that it neither runs over, or boils too fast; and, when it is very well boiled, put in your ware, and fiir it about till you find that it has taken the dye equal every where; then cool and rince them. bear a very weat a page a stock decade a residence of the

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some of filk put an euncoint cochineral i fire the

system the inductor and find them formed white the state the state that the state

necial care that the filk is not party-coloured. Sport The filk having been prepared as before directed, allow an ounce and an half of cochineal to every pound of filk, pound it to powder, and pass it through a hair fieve; then put it into the remaining pail of liquor last mentioned, and hang it over the fire again; then with the liquor put it into a brass kettle, and cover it very close that no dust may get in; hang it over the fire again, and add to it an ounce and a half of white arfenic, and two ounces and a half of tartar, both reduced to a fine powder; boil them together for a quarter of an hour; then take it off the fire, and put in the filk, flirring it about very well, that the colour may not be variegated, when the liquor is cold; then wring out the filk, and, if it is not tinged enough, hang the dye over the fire again, and after the filk has been beaten, put it in again as before. When the filk is dyed, you must, in the first place, rince it out in hot fuds, made by putting half a pound of Venice foap, in proportion to every pound of filk; let it be diffolved in it, and afterwards put the filk into cold river water; then beat it upon a block, and hang it to dry; then spread it abroad, and manage it according to custom, and it will be a beautiful crimfon. If you would dye crimfon from a violet ground, you may always abate one third part of the quantity of the ingredients; that is, a pound of filk, to grounded, will not require above an ounce of cochineal, as much of arsenic, and two ounces of

To dye filk a Dove Crimson.

way bandara sar tana or book

The filk having been allumed, as above directed, clean rinced, and hung upon poles, take a kettle, fcour it very clean, fill it with water, and to each

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pound of filk put an ounce of cochineal; stir the filk in the liquor, and boil them for an hour; then since the filk out, wring, and dry it. You must take special care that the filk is not party-coloured, or of different colours, by taking the colours better in one place than in another; and for that reason, it must be put in when the liquor is no more than luke-warm.

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in the To dye filk an Orange Crimfon.

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Put clean rain water into a very clean kettle, then put four ounces of pot ashes, and four ounces of orleans; strain them through a sieve into the kettle, and dissolve them very well: the boiled and allumed sik being first well rinced from the alum, must be stirred about in it and boiled, then wrung out, rinced and beaten; then to every pound of sik take twelve ounces of galls, which boil two hours, and then let them cool for two hours, and afterwards lay the silk to soak in it for three or four hours; after which take it out, wring, rince, beat, and dry it.

bootde was brond To dye Black.

For stuffs of little value, it is sufficient that they be well blued with pastel, and blackened with galls and copperas; but no stuffs can be regularly dyed from white into black, without passing into the intermediate blue: yet there is a colour called cold black, or Jesuits black, but without being first dyed blue. In this case the drugs are dissolved in water, that has boiled four hours, and stood to cool till the hand can bear it; then the stuff is dipped in again and again, and taken out six or eight times.

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at the square and heir them for an To dye black upon blue.

Take about nine or ten gallons of water, as many ounces of nut galls beaten; wool, woollen yarn, woollen cloth or flannel, to the weight of about three pounds; let them be boiled for four hours, after which, take the matter out and open them to the air; then put into the liquor eighteen ounces of green copperas; and if there be not liquor enough left. put in more water, as much as will cover the stuffs. &c. and boil it for two hours, handling it continual. ly: then take it out again and air it, and put it in again till it is black enough; after this cool and walk it :- but, if you put in some sumach with the galls. it will make a better black.

To recover the colour of black cloth when decayed.

nulla construiches

Boil the leaves of fig-trees well in water, wash the cloth in it, dry it in the fun, and it will be a much fairer black.

To dye Silk black.

Pour three pails of water into a copper, and add two pounds of beaten galls, two pounds of fumach, and two ounces of madder, four ounces of antimony reduced to an impalpable powder, two of oxgall, one ounce of madder, one ounce of tragacanth; let them diffolve a proper time, and then put in a proper quantity of dry elder-bark powdered, two pounds of vitriol, and twelve ounces of filings of iron : then pour off the Ablack water, and let them boil together two hours; after which, fill it up with half a pail-full of barley, or rather malt water which is drawn off by the brewers; after boiling again half an hour, put in the filk; let

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boil gently for half an hour, then take it out and ince it in a copper full of water, and throw it again nto the dye; and, afterwards, when you take it out. ince it very clean in river water; hang it up in the ir to dry, then put it into the dye again, and boil it ently for half an hour, rince it in the copper as beore, and afterwards in river water, and, when it is lry, take good ley, and add two ounces of pot ashes; ince the filk very well in this liquor, and, laftly, in iver water, then dry it, &c.

An additional improvement to the former dye.

Having dyed filks black, as before, take fal armoinc and antimony powdered two ounces, filings of on two handfuls; put them together in a copper hat has been drawn off, and hath been used before. take it so hot that you can but just bear your hand nit, that this additional dye may the better penerate: then take the black filk, having been well through water, in which a proper quantity of gum agacanth has been disolved, taking care that it be horoughly wetted: then dry it as usual.

To give a lustre to black filks.

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After the filk has been dyed, for every pound of it als the filk through the liquor, and it will be of a nti- try beautiful lustre.

the Ablack dye for re-dying Hats, or any thing that has loft its black colour.

Take half a pound of blue Provence wood, boil it

in a pint of strong beer, till half of it be confumed; then add half a pound of vitriol, and an ounce of verdigrease; take out the wood, and put in a quarter of an ounce of gum tragacanth; let it stand, and when you have occasion to use it, dip a little brush in it, and so streak it over the hat or silk, and it will give a fine lasting black.

A good yellow dye for Silks, &c.

First boil the cloth or stuff in alum and pot ashes, and rince it out; then procure a clean kettle, put in a sufficient quantity of water, and for every pound of silk put in two pounds of yellow wood, and six ounces of galls; let the yellow wood boil an hour before you put in the galls, and afterwards boil them together for half an hour, and then put in the silk, stirring the dye; then wring it out of the kettle with a little pot ashes, and, after it has been wrung out, put it into the dye again, and leave it there to soak for a whole night, and in the morning rince, beat, and dry it.

To dye Stuffs a brimstone yellow.

Boil the stuff in three pounds of alum, one pound of tartar, and three ounces of salt, for an hour; throw away the water, then make a liquor of yellow brown, laying it in the same order as straw in brewhouses; then add ley ashes, and draw the stuff through the dye three or four times very quick: to do which dexterously it will require the assistance of three or four men.

To dye Thread yellow.

Boil eight pounds of broom, one pound of Spanish

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tellow, one pound of crab-tree rind, and one pound of corn marigold in a kettle, with three quarts of harp ley; and work the thread in the liquor three imes successively, not suffering it to dry between, and it will be of a beautiful and lasting colour.

To dye Stuffs a Braw-colour.

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First dye the goods yellow, and throw half a pint of urine into the dye: put in the goods, and work them about as long as you think convenient.

To dye Silk a firaw-colour.

First alum and rince the filk, and for every pound of it boil one pound of broom flowers for a quarter of in hour; then pour it into a tub, which must be in ize proportionable to the quantity of filk; then put wit an equal quantity of water, and, after you have firred the filk in it, fill the kettle again with water. and boil it half an hour: the filk being wrung out of the first suds, put them into the second; and if you fee occasion, make a stronger yet, and stir the lks in it, till the colour is sufficiently heightened; then rince it, and hang it up to dry.

To dye Silk an orange-colour.

First lay the white filk in alum water, in the same nanner as the yellow; then take the eighth part of e of spound of orleans, dissolve it in water for the space of one night, add to it one ounce of pot asses; boil t for an hour, then add an ounce of beaten turmeric; hir it very well, let it stand a little while, and then put in the allumed filk, and let it remain there, one, two, or three hours, according as you would have

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the colour light or dark: rince it in fine foap sud till it is perfectly clean, then beat and dry it.

ob now that bor To dye Silk a gold colour.

This must be dyed after the same manner as the straw-colour is, only when it is become reasonably deep, put it into the last suds of the orange liquor, and stir it therein so long, till you are sure it is grown deep enough; then rince it out and dry it.

Greens for Silks.

For every pound of filk take a quarter of a pound of alum, two ounces of white wine tartar beaten fmall; dissolve them together in hot water, then put in the filk, letting it lie a whole night: then take it out and dry it; having done this, take a pound of broom, boil it in a pail and a half of water for an hour or better: then take out the broom and throw it away, and put in half an ounce of beaten verdigreafe, ftirring it about with a ftick; then put in the filk for a quarter of an hour, take it out and let it lie till it is cold; then put in one ounce of pot ashes ftir them about and put in the filk again, keep it there till you think it is yellow enough, then rince it out and let it dry: after which put it into the blue dye vat or copper, and let it remain there till it becomes green and dark enough; then take it out and you will have a good green: then let it be beaten and dried. You may let it lie a longer or lesser while in the dye, according as you would have the green lighter or darker, for at first you will have but a faint green.

Grass Green.

First dye your silk a pretty deep straw colour, rince

clean, and wring it close together with flicks; and then put your filk into the blue dye copper; though ou must take care that the strength of the dye be proportioned to the quantity of filk, and that you do not put in too much filk at once. When it has boiled enough take the kettle off, and let it stand for an hour, after which time you may work it again, and to the same every hour, allowing the same interval, but you must be very careful that one handful of filk bes not lie longer in than another, and when it is aken out of the copper, let it be very well cooled, finced, and strongly wrung with sticks, and afterwards dried ...

To dye Linen green.

Lay the linen a whole night in strong alum water, do of the well, then boil broom or dyers weed, for an hour; take it out, and put into the suds either half tow a whole ounce of verdigrease, according to the quantity of the ware you have to dye; stir it well at the bout with a stick, and then work the linen in it once, twice, or thrice, as occasion requires, adding the second and third time a quantity of pot ashes equal to an hen's egg; then work your linen a third time, and you will find it of a yellow colour; then dry it in the blue sir, and afterwards throw it into the blue var see blue ir, and afterwards throw it into the blue vat (fee: be- blue) and that will produce the green you defire.

To die Thread of a lasting green.

faint Boil three quarters of a pound of alum, half a pound of tartar, in two quarts of sharp ley for an lour, and in it foak the thread for three hours, keeping it hot all the while. How to dye it yellow. Put into the kettle eight pounds of broom, one pound of orn marigold flowers, half a pound of crab-tree bark, that looks yellow and ripe, and super add two

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quarts of sharp ley; when these have boiled half an hour, then dye the thread in the liquor as deep a yellow as possible; but if you can procure Spanish Yellow, an addition of three quarters of a pound of it will heighten the dye, and render it more lasting; for it is to be remembered, that all yellows, that are designed to be died green, must be as deep as possibly they can be. After this turn it green with blue dye. You may blue the thread with woad, else with Indigo, being first thrown into the alum suds, and afterwards into the yellow, and you will have a lasting green, so that a green is to be dyed several ways.

To dye Stuff a gold colour.

Let the stuff be first dyed yellow, then set fresh water over the fire, and for every pound of ware use an ounce of sustel-wood, called also yellow shavings and a good quantity of coarse pot ashes; let the dye boil for half an hour, and afterwards work the stuff in it.

To dye Woollen Suffs green.

First dye the stuffs yellow with broom or dye weed rince them well out, and while they are wet past them through the blue dye, and work it, till it is the colour you would have it, either light or dark, so that several shades or sorts of green may be dyed the same way, the stuffs having been always tinged with yellow.

To die a brown or Iron green.

For a piece of stuff fifteen ells, take twelve ounce of alum, half a pound of tartar, two ounces of cal cined vitriol; in these boil the stuff for half an hour then rince it in clean water; and when it is drye for Ho of : the foll hal flic and hal ver

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for the blue, you may throw away the alum fuds. How to blue it. The ware being blued with woad of a light or deep brown according to your mind, then rince it again, dry it, and prepare it for the following yellow: Boil eight pounds of broom for half an hour, keeping it down in the kettle with a slick that it does not float on the top of the water; and, when you use it, add two quarts of sharp ley, half an ounce of flour of brimstone, and an ounce of verdigrease; then die the goods but only once, and it will be of a beautiful brown or iron green.

To dye a Sea Green.

For every pound of filk take three ounces of verdigrease pounded small, put it into good white wine, or sharp vinegar to dissolve: let it lie a whole night in it, in the morning set it over the fire and make it hot, stirring it about with a stick; and then put in the filk, but take care not to let it boil; and let it remain two hours, or one, or half an hour, according as you would have the colour a deep, middling, or light green; then put some boiling hot water into a vat or tub, to which add half an ounce, or an ounce of soap, and make a lather; when it froths it is ready; then hand the siks in it, let them drop afterwards, and rince them in river water, beat them very well, and dry them

To dye Stuffs, Gc. Purple.

Allow a sufficient quantity of fair water to every pound of stuff; one pound of tartar, and two ounces of alum, in which boil the cloth for an hour; then take it out, cool, and rince it; after this warm some clean water, into which put in three ounces of brasil wood, boil it half an hour, and then work the stuffs in it till they become as red as desired: Upon which,

take them out and put into the dye two ounces of pot ashes; stir it well about, and put in the red stuff once more; roll it off, and on the roller, that it do not spot, then cool and rince it out.

To dye Silks a flight Purple.

Put the filk into a flight red dye, but increase the quantity of pot ashes, to turn it to purple; then rince and dry it.

To dye Thread of a Purple Colour.

First alum the thread with three pounds of alumhalf a pound of tartar, and two ounces of brafil; dry it, and draw it through the woad or indigo dye; then rince it clean and dry it again; then, to brown or deepen it, take twelve ounces of brafil, being first boiled; which liquor divide into three parts, to be used at three times. To the first add half an ounce of Paris red, a fort of fandarach, one drachm of maflick, and a quarter of an ounce of calcined tartar; always drying the thread after you have used every one of the parts of the liquor. The fecond time add half an ounce of turmeric, two drachms of cinnabar, and half an ounce of gum arabic. The third time, when the thread becomes reddish, add a quart of fharp lev, and by this means the thread will be dyed of a lasting colour.

To dye a Scarlet Colour in Grain.

Take stale clear wheat bran liquor, a sufficient quantity, alum three pounds; enter twenty ells of broad cloth, and boil it three hours, cool and wash it: take fair water a sufficient quantity, hedder or strawel a fit quantity: let them boil well, cool them brig who four it t fress boil ther

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or m with a little water, enter your cloth and make a bright yellow, cool and wash it again; take fresh wheat bran liquor, a sufficient quantity: madder sour pounds, enter your cloth at a good heat, handle it to a boiling, cool and wash it well; take more fresh bran liquor, cochineal in fine powder, sive ounces; of tartar three ounces; enter your cloth, and boil it an hour or more, keeping it under the liquor, then cool and wash it:

To dye Stuffs of an Olive Colour.

This must be ordered as the brimstone yellow, after which prepare suds of galls and copperas, but not strong; through which pass the stuffs, and two or three times, according as you would have the dye lighter or deeper, and it will produce an olive colour,

Dying of Leather.

To dye Leather of a Reddift Colour.

First wash the skins in water, wring them well out, and afterwards wet them with a solution of tartar and bay-salt in fair water, and wring them out again: then to the former solution add ashes of crab-shells, and rub the skin very well with this; after this wash them in common water, and wring them out; then wash them with tincture of madder in the solution of tartar and alum and the crab-shell ashes; and if they prove not red enough after all, wash them with tincture of brasil.

To dye Leather of a pure Yellow.

Take of fine aloes two ounces, of linfeed oil four pounds; dissolve or melt them, then strain the liquor, and besmear the skins with it, and, being dry, varnish them over or insuse wood in vinegar, in which boil a little alum; or thus, having dyed them green, as directed, then dye them in a decoction of privet-berries, sassron, and alum water.

To dye Leather Blue.

Boil elder-berries or dwarf-elder in water, then fmear or wash the skins with it; wring them out, then boil the berries as before in a solution of alum water, and wet the skins in the same water once or twice, dry them, and they will be very blue: or take the best indigo, and keep it in urine a day, then boil it with alum, and it will be good: or temper the Indigo with red wine, and wash the skins with it.

To dye Leather of a pure Sky Colour.

For each skin take indigo one ounce, put it into boiling water, let it stand one night, then warm it a little, and with a brush pencil besmear the skin twice over.

To dye Leather Purple.

Diffolve roch alum in warm water, wet the skins with it, dry them, then boil rasped brasil well in water; let it stand to cool: do this three times, and asterwards rub the dye over the skins with your hand, and when they are ready polish them.

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To dye Leather Green.

Take sap green and alum water, of each a sufficient quantity; mix and boil them a little; if you would have the colour darker, add a little indigo.

To gild Leather.

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ns aafd, Take glair of the whites of eggs, or gum water, and with a brush rub over the leather with either of them, and then lay on the gold or filver; let them be dry, and burnish them.

To drefs or cover Leather with Silver, or Gold.

Take the colour called brown red, and grind it on a stone with a muller, adding water and chalk; and when the latter is dissolved, rub, or lightly daub the skins over with it, till they look a little whitish; and then lay on the leaf silver or gold, before they are quite dry, laying the leaves a little over each other, that there may not be the least omitted; and when they have well closed with the leather, and are sufficiently dried on and hardened, rub them over with a polither made of smooth ivory, or of the fore tooth of a horse, and it will appear very bright.

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CHAP. XXIII.

Of the means of taking Casts and Impressions, from Figures, Bufts, Medals, Leaves, &c.

THE method of taking casts of figures and busts. as at present practifed, is most generally by the use of plaister of Paris; or, in other words, alabaster calcined by a gentle heat. The advantage of using this substance preferable to others, consists in this, The that notwithstanding a slight calcination reduces it to mode a pulverine state, it becomes again a tenacious and ster a pulverine state, it becomes again a tenacious and offer cohering body, by being moistened with water; and afterwards suffered to dry. By this mean either a soub concave or convex figure may be given by a proper mold or model to it when wet, and retained by the mold hardness it acquires when dry: and from these qualities, it is sitted to the double use of making both only casts, and molds for forming those casts. The plainter is to be had ready prepared of those who make it their business to fell it, and the only care is to see that it is genuine. that it is genuine.

The particular manner of making casts depends on the form of the subject to be taken. Where there arts, are no projecting parts, it is very simple and easy; arts as likewise where there are such as form only a right for a greater angle, with the principal surface of the body; but where parts project in lesser angles, or soph form curves inclined towards the principal surface of the body, the work is more difficult. We shall say from the body, the work is more difficult. We shall say from the body are general to all kinds; and then point out asy be the extraordinary methods to be used where difficult the ties occur.

ties occur.

The first step to be taken is, the forming the mold: which is, indeed, done by much the fame means, as the cast is afterwards made in it. In order to this. If the original or model be a bal's relief, or any other piece of a flat form, having its furface first well grealed, it must be placed on a proper table, or other such support; and surrounded by a frame, the sides of which must be at fuch a distance from it, as will allow a proper thickness for the fides of the mold. A due quantity of the plaister, that is, what will be fufficient to cover and rife to fuch a thickness as may eive fufficient strength to the mold, as also to fill the follow betwixt the frame and the model, must be moistened with water, till it be just of such consistmee as will allow it to be poured upon the model. is, The plaister thus moistened must then be put on the to model as soon as possible; for it must not be delayed after the water is added to the plaister, which would therwise concrete or set, so as to become more resorbly to be used. The whole must then be suffered to remain in this condition, till the plaister has attained its hardness, and then the frame being taken away, the preparatory cast or mold thus formed may be taken off from laid the subject entire.

Where the model or original subject is of a round see subject entire.

Where the model or original subject is of a round see the subject consists of detached and projecting arts, it is frequently most expedient to cast such sight ther.

Where the original subject or model forms a round, or spheroid, or any part of such round or spherodi, et arts separately; and afterwards join them together.

Where the original subject or model forms a round, or spheroid, or any part of such round or spherodi, et arts separately; and afterwards join them together.

Where the original subject or model forms a round, or spheroid, or any part of such round or spherodi, et arts separately; and afterwards join them together.

The whole must be used without that more than one half the plaister must be used without any frame to keep it round the model; and must be more more of stat-sigured models, it must yet be as moist at though it must not be so sluid, as when prepatit for stat-sigured models, it must yet be as moist at though it must not be so sluid, as when prepatit for stat-sigured models, it must yet be as moist as the subject of stat-sigured models, it must yet be as moist as the subject of stat-sigured models, it must yet be as moist as the subject of stat-sigured models, it must yet be as moist as the subject of stat-sigured models, it must yet be as moist as the subject of stat-sigured models, it must yet be as moist as the subject of stat-sigured models. is, The plaister thus moistened must then be put on the

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as if compatible with its cohering fufficiently to hold together Being thus prepared, it must be put up on the model, and compressed with the hand, or any flat instrument, that the parts of it may adapt them felves, in the most perfect manner, to those of the Subject, as well as be compact with respect to them felves. do When the model is fo covered to a conve nient thickness, the whole must be left at rest till the plainter be fo firm as to beat dividing without falling to pieces; or being liable to be put out of its form by flight violence. It must then be divided in to pieces; in order to its being taken off from the model, by cutting it with a knife, or with a very thin blade; and being divided, must be cautiously taken off, and kept till dry. But it must be alway carefully observed, before the separation of the part be made, to notch them cross the joints, or lines of the division, at proper distances, that they may with eafe and certainty be properly conjoined again; which would be much more precarious and troubleform without fuch directive marks. The art of properly dividing the molds, in order to make them separat from the model, constitutes the great object of dex terity and skill in the art of casting; and does no admit of rules for the most advantageous conduct of it in every case. But we shall endeavour to explain the principles on which it depends in fuch a manner that by a due application of them, all difficulties ma at any time be furmounted, and an experiness eve of manner acquired by a little practice. With re spect to the case in question, where the subject is a round or spheroidical form, it is best to divide the mold into the three parts, which will then eafil come off from the model: and the same holds goo of a cylinder, or any regular curve or figure.

The mold being thus formed and dry, and the parts put together, it must be first greafed and place and then filled with plaister commixt with water, the same proportion and manner as was directed for before he balting the mold: and when the call is perfectly let, and dry, it must be taken out of the mold and epaired, when it is necessary; which finishes the fluc inframent, that the parts of it moitaning slong

This is all that is required with respect to subjects, where the furfaces have the regularity above mensoned. But where they form curves which interted each other, the conduct of the operation must be varied with respect to the manner of taking the all of the mold from off the subject or model; and where there are long projecting parts, fuch as legs or arms, they should, as was observed before, be

wrought in separate casts.

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The method of dividing properly the molds cannot be reduced, as already has been intimated, to amy particular rules; but must depend in some degree on the skill of the operator, who may easily judge from the original subjects, by the means here sugtelled, what parts will come off together, and what equire to be separated. The principle of the whole confifts only in this, that where under-workings, as hey are called, occur, that is, wherever a fraight ine drawn from the basis or insertion of any projeclex. no tion would cross the fraight line; or, as that is frequently difficult, the whole projection must be sepaated from the main body, and divided also lengthner ways into two parts. Where there are no projecmay lions from the principal furfaces, but the body is fo he furface of one part would be cut by the outline, the none or more places, of another part, a division of the whole should be made, so as to reduce the parts good it into regular curves, which must then be treated to such.

the Where detached parts of a long form, as legs, are suns, spears, swords, &c occur in any figure, they ard bould be cast in separate molds; and if such parts re of a compound thructure, the same rules, as was ferefore intimated, must be observed in the manage-

ment of behein, as ago already directed for the print

In larger masses, where there would otherwise be a great thikness of the plaister, a corps or body may be put within the mold, in order to produce a hollow in the cast; which both saves the expense of the plaister, and renders the cast lighter.

This corps may be of wood, where the forming a hollow of a straight figure, or such as is conical with the basis outward, will answer the end. But if the cavity requires to be round, or any curve figure, the corps cannot be then drawn while entire; and confequently should be of such matter, as will suffer itself to be taken out piece-meal. In this case, therefore, the corps is best formed of clay; which must be worked upon wires to give it tenacity; and when the plaister is sufficiently set to bear handling, the clay must be picked out by a proper instrument.

Where it is desired to render the plaister harder, the water with which it is tempered should be mixed with parchment size, which will make it very firm and tenacious; the preparation for which is as fol-

lows:

Fake a pound of cuttings of parchment, or of the leather used by glovers; and, having added to them fix quarts of water, boil them till the quan-

tity of the fluid be reduced to two quarts; or till,

on the taking out a little, it will appear like a jelly on growing cold. Strain it through a flannel while

hot; and it will then be fit for use,'

In the same manner, figures, busts, &c. may be cast of lead, or any other metal, in the molds of phrister; only the expence of plaister, and the tediousness of its becoming sufficiently dry, when in a very large mass, to bear the heat of melted metal, renders the use of clay, compounded with some other proper materials, preferable, where large subjects are in question. The clay, in this case, should be washed over till it be perfectly free from gravel or stones; and then mixed with a third or more of

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fine fand, to prevent its cracking: or instead of fand, coal ashes sifted till they be perfectly sine is prefer ble. Whether plaister, or clay be used for the cast" ing in metal, it is extremely necessary to have the mold perfectly dry; otherwise, the moisture being wified, will make an explosion, that will blow the metal out of the mold, and endanger the operator, or at least crack the mold in such a manner as to. frustrate the operation. Where the parts of a moldare larger, or project much, and consequently require a greater tenacity of cohesion of the matter they are formed of to keep them together, flocks of cloth, or fine cotton, pluckt or cut till it is very hort, should be mixt with the ashes or fand, before they be added to the clay to make the composition. for the mold. The proportion should be according to the degree of cohesion required: but a small quantity will answer the end, if the other ingredients of the composition be good; and the parts of the mold properly linked together by means of the wires before directed.

ill, Casts of medals, or such small pieces as are of a sally smilar form, may be made in plaister, by the method chiefly made use of for bass relieves. And indeed there is nothing more required than to form a mold, by laying them on a proper board; and, having furrounded them by a rim made of a piece of edicard or any other pasteboard, to fill the rim with na foft tempered plaister of Paris: which mold, when tal, dry, will serve for several casts. It is nevertheless a better method to form the mold of melted sulphur;
which will produce a sharper impression in the cast,
and be more durable than those made of plaister.
The casts of medals are likewise frequently made

of fulphur: which being melfed, must be treated exactly in the same manner as the plaister.

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Casts may be made likewise with iron, with very little additional trouble, provided it be prepared in the following manner:

having heated it red hot, hold it over a vessel containing water; touch it very slightly with a roll of sulphur; which will immediately dissolve it; and make it fall in drops into the water under it:

then as much iron as may be wanted being thus diffolved, then pour the water out of the vessel; and

pick out the drops formed by the melted iron from

those of the sulphur, which contain little iron, and will be distinguishable from the other by their co-

· lour and weight.

The iron will, by this means, be rendered fo fufible, or easy to be melted, that it will run with less heat than will melt lead; and may be employed for making casts of medals; and many other such purposes, with great convenience and advantage.

Impression of medals, having the same effect as casts, may be made also of isinglass glue by the following means: Melt ifinglass, beaten as when commonly used, in an earthen pipkin, with the addition of 28 much water as will cover it, ftirring it gently till the whole be diffelved. Then with a brush of camel's hair, cover the medal; which should be previously well cleanfed and warmed, and laid horizontal on a board or table greafed in the part around the medal. Let them relt afterwards till the glue be properly hardened; and then, with a pin, raife the edge of it, and separate it carefully from the medal; the cast will be thus formed by the glue as hard as horn; and so light, that a thousand of them will fearcely weigh an ounce, In order to render the relief of the medal more apparent, a small quantity of carmine may be mixed with the melted ifinglass; or the medal may be previously coated with leaf gold by breathing on it, and then laying it on the leaf, which ted will by that means adhere to its but the use of the eaf gold is apt to impair a little the sharpness of the mpreffion. Inog office wife with room ad war effect.

There is likewife a method of making impressions of the fame kind in lead; which is this: Lay the medal on a post, or other firm body of wood; and over it with a piece of very thin plate of lead; and by over that another piece of thicker plate Then place on them end-ways, a piece of wood turned of tround figure, which may be a foot or more in length; and of fuch thickness, that its diameter may be somewhat greater than that of the medal. Strike then forcibly on the upper end of the wood with a mallet, or fome fuch intrument; and the undermost plate of lead will receive the impression of the medal: to preferve which, the concave of the reverse may be filled up with refin, mixed with an equal part of brick dust, and melted. The impression should be made with one stroke; which will produce a fufficient effect, if given with due strength, and in a perpendicular direction. Impressions may be even taken from fealing wax or fulphur in this manner, if the pieces be no way bending on their under fide,

Impressions of medals may be likewise taken in putty; but it should be the true kind made of earth, of tin, and drying oil. These may be formed in the molds previously taken in plaister or sulphur, or molds may be in its own substance, in the manner directed for those of the plaister. These impressions will be very sharp and hard: but the greatest disadvantage that attends them, is their drying very flowly, and being liable in the mean time to be damaged.

Impressions of prints, or other engravings, may 28 be taken from copper plates, by cleaning them thowill roughly, and pouring plaister upon them; but the reeffect, in this way, is not strong enough for the eyes of and therefore the following method is more prefeor rable, especially where such impressions on plaister

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finely powdered, and rub it over the plate. Then pals a folded piece of paper, or the flat part of the hand, over the plate, to take off the colour from the lights or parts where there is no engraving. The proceeding must then be the same, as where no colour is used. This last method is also applicable to the making impressions of copper plates on paper with dry colours: for the plate being prepared as here directed, and laid on the paper properly moistened, and either passed under the rolling-press, or any other way strongly forced down on the paper, an impression of the engraving will be obtained.

Impressions may be likewise taken from copper plates, either on plaister or paper, by means of the smoke of a candle or lamp; if, instead of rubbing them with any colour, the plate be held over the candle or lamp, till the whole surface is become black, and then wiped off by the slat of the hand,

or paper.

These methods are not, however, of very great use in the case of copper plates; except where impressions may be desired on occasions where printing ink cannot be procured. But as they may be applied likewise to the taking impressions from snuff-boxes, or other engraved subjects, by which means designs may be instantly borrowed by artists or curious persons, and preserved for any use, they may in such in-

stances be very ufeful.

The expedient of taking impressions by the smoke of a candle or lamp may be employed also for botanical purposes, in the case of leaves; as a perfect and durable representation of not only the general figure, but the contexture and disposition of the larger fibres, may be extemporaneously obtained at any time. The same may be, nevertheless, done in a more perfect manner, by the use of linseed oil, either alone, or mixed with a small proportion of colour, where the oil can be conveniently procured. But the other method is valuable, on account of its being practicable at all seasons, and in all places, within the time that

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the leaves will keep fresh and plump. In taking these impressions, it is proper to bruise the leaves, to as to take off the projections of the large ribs, which might prevent the other parts from plying to the paper.

plants, may themselves be preserved on paper, with their original appearance, for a considerable length of time, by the sollowing means: Take a piece of paper, and rub it over with the isinglass glue, treated as above directed for taking impressions from medals; and then lay the leaves in a proper position on the paper. The glue laid on the paper being set, brush over the leaves with more of the same; and that being dry likewise, the operation will be sinished; and the leaves so secured from the air and moisture, that they will retain their figure and colour much longer than by any other treatment.

Butterflies, or other small animals of a flat figure,

may also be preserved in the same manner,

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or day) of ven CoH A P. XXIV.

Of staining Wood, Ivory, Bone, Horn, Alabatter, Marble, and other Stones of various Colours.

Of Raining Wood yellow.

TAKE any white wood, and brush it over several times with the tincture of turmeric root, made by putting an ounce of the turmeric ground to powder to a pint of spirit; and, after they have stood fome days, straining off the tincture. If the yellow colour be defired to have a redder caft, a little dragon's blood must be added, in the proportion that will produce the teint required. A handond sand

A cheaper, but less strong and bright yellow, may be given to wood, by rubbing it over several times with the tincture of French berries, prepared as fol-

lows, and made boiling hot.

' Take a pound of French berries, and put to them a gallon of water, with half an ounce of alum;

boil them an hour in a pewter vessel, and then fil-

ter off the fluid, (through paper if it be designed for nicer purpoles, or flannel for more ordinary.)

Put them again into the boiler, and evaporate the

fluid till the colour appear of the strength defired; or any part may be taken out while it is less strong,

and the rest evaporated to a proper body.'

After the wood is again dry, it should be brushed over with a weak alum water used cold.

Lesser pieces of wood, instead of being brushed over with them, may be foaked in the decoctions or

a nouatni svod Wood may also be stained yellow by means of Aqua Fortis; which will sometimes produce a beautiful yellow colour, but at other times a browner. The wood should be warm when the Aqua Fortis is laid on; and be held to the fire immediately afterwards; and care must be taken, that either the Aqua Fortis be not too strong; or that it be sparingly used; otherwise a brown, sometimes even a blackish colour, may be the refult.

In order to render any of these stains more beautiful and durable, the wood should be brushed after it is coloured; and then varnished by seed-lac varnish, or, when defired to be very strong, and to take a high polith, with three or four coats of shell-lac var-

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some days, fivalning off the tincture. If the yellow colour be defire by bow grining to all the dear roas blood muft be added, in the proportion that

For a bright red stain for wood, make a strong infusion of Brazil in stale urine, or water impregnated
with pearl-ashes, in the proportion of an ounce to a
gallon; to a gallon of either of which, the proportion
of Brazil wood must be a pound; which being put
to them, they must stand together two or three days,
often stirring the mixture. With this infusion strained, and made boiling hot, brush over the wood to be
stained, till it appear strongly coloured; then, while
yet wet, brush it over with alum water made in the
proportion of two ounces of alum to a quart of water.

For a less bright red, dissolve an ounce of dragon's blood in a pint of spirit of wine; and brush over the wood with the tincture, till the stain appear to be as strong as is desired. But this is, in sact, rather lacquering than staining.

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For a pink or rose red, add to a gallon of the above insusion of Brazil wood two additional ounces of the pearl-ashes, and use it as before directed: but it is necessary, in this case, to brush the wood over often with the alum water. By increasing the proportion of pearl ashes, the red may be rendered yet paler: but it is proper, when more than this quantity is added, to make the alum water stronger.

These reds, when it is necessary, may be varnished as the yellows.

Of faining Wood blue.

Wood may be stained blue, by means either of copper or indigo, but the first will afford a brighter colour; and is more generally practicable than the latter: because the indigo can be used only in that state to which it is brought by the manner of prepa-

ration used by the dyers: of whom indeed it must be had, as it cannot be properly so prepared but in large quantities, and with a particular apparatus. The method of staining blue with the copper is therefore as follows:

Take of the refiners solution of copper made in the precipitation of filver from the spirit of nitre;

or diffolve copper in spirit of nitre or aqua fortis,

by throwing in filings, or putting in flips of copper gradually, till all effervescence cease. Add to it of

Harch finely powdered, the proportion of one fifth

or fixth of the weight of the copper dissolved.

Then brush the copper solution, while hot, several times over the wood. When this is done, make a

folution of pearl ashes, in the proportion of two

ounces to a pint of water; and brush it hot over the

wood stained with the folution of copper, till it be

of a perfect blue colour.'

Wood stained green as above by verdigreafe, may likewise be made blue, by using the solution of the pearl ashes in the same manner.

When indigo is used for staining wood blue, it must

be managed thus;

Take indigo prepared with foap lees as when ufed by the dyers; and brush the wood with it boil-

ing hot. Prepare then a folution of white tartar,

or cream of tartar, which is to be made, by boil-

• ing three ounces of the tartar, or cream, in a quart • of water: and with this folution used copiously,

brush over the wood before the moissure of the tinc-

ture of indigo be quite dried out of it."

These blues may be rushed and varnished as the reds, where there is occasion.

Of staining Wood of a Mahogany colour.

Mahogany colour is the most useful of any stain for wood (especially since the veneering with different colours is out of fashion) as it is much practised at pre-

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or four he var fent for chairs and other furniture made in imitation of mahogany; which, when well managed, may be brought to have a very near refemblance.

This stain may be of different hues, as the natural wood varies greatly, being of all the intermediate teints betwixt the red brown, and purple brown, according to the age, or sometimes the original nature

of different pieces.

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For the light red brown use a decoction of madder and sustice wood, ground in water; the proportion may be half a pound of madder, and a quarter of a pound of sustic, to a gallon: or in default of sustic, an ounce of the yellow berries may be used. This must be brushed over the wood to be stained, while boiling hot, till the due colour be obtained; and, if the wood be kindly grained, it will have greatly the appearance of new mabogany.

The same essect nearly may be produced by the sincture of dragon's blood, and turmeric root, in spinit of wine: by increasing or diminishing the proportion of each of which ingredients, the brown stain may be varied to a more red or yellow cast at pleasure. This succeeds better upon wood, which has already some little tinge of brown, than upon whiter.

For the dark mahogany, take the infusion of madder, made as above, except the exchanging the sufficfor two ounces of logwood: and when the wood to be stained has been several times brushed over, and is again dry, it must be slightly brushed over with water in which pearl-ashes have been dissolved, in the proportion of about a quarter of an ounce to a quart.

Any stains of the intermediate colours may be made by mixing these ingredients, or varying the proportion of them.

Where these stains are used for better kind of work, he wood should be afterwards varnished with three or four coats of seed-lac varnish; but for coarse work, he varnish of resin and seed-lac may be employed,

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or they may be only well rubbed over with drying oil.

Of Staining Wood green.

Dissolve verdigrease in vinegar, or chrystals of verdigrease in water, and, with the hot solution, brush over the wood till it be duly stained.

This may be brushed and varnished as the above.

Of Staining Wood purple.

Brush the wood to be stained several times with a strong decoction of logwood and brasil, made in the proportion of one pound of the logwood, and a quarter of a pound of the brasil, to a gallon of water, and boiled for an hour or more. When the wood has been brushed over till there be a sufficient body of colour, let it dry; and then be slightly passed over by a solution of one drachm of pearl-ashes in a quart of water. This solution must be carefully used, as it will gradually change the colour from a brown red, which it will be originally sound to be, to a dark blue purple; and therefore its effect must be restrained to the due point for producing the colour desired.

This may be varnished as the rest.

Of flaining Wood black.

Brush the wood several times with the hot decoction of logwood, made as above; but without the brasil. Then having prepared an insussion of galls by putting a quarter of a pound of powdered galls to two quarts of water, and setting them in the surshine, or any other gentle heat, for three or sour days brush the wood, three or sour times over with it; and then pass over it again, with a solution of

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green vitriol in water, in the proportion of two oun-

ces to a quart.

The above is the cheapest method: but a very fine black may be produced, by brushing the wood several times over with a solution of copper in Aqua Fortis; and afterwards with the decoction of logwood, which must be repeated till the colour be of sufficient sorce; and the greenness, produced by the solution of the copper, wholly overcome.

These blacks may be varnished as the other co-

lours.

Of flaining Ivory, Bone, or Horn.

Of Staining Ivery, Bone, or Horn, yellow.

Boil them first in a solution of alum, in the proportion of one pound to two quarts of water; and then prepare a tincture of the French berries, by boiling half a pound of the berries, pounded, in a gallon of water, with a quarter of a pound of pearlashes. After this tincture has boiled about an hour, put the ivory, &c previously boiled in the alum water, into it; and let them remain there about half an hour.

If turmeric root be used, instead of the Frenchberries, a brighter yellow may be obtained; but the ivory, &c. must in that case be again dipt in alum water after it is taken out of the tincture; otherwise an orange colour, not a yellow, will be produced from the effect of the pearl-ashes on the turmeric.

Of staining Ivery, Bone, and Horn, green.

They must be boiled in a folution of verdigrease C c 2 in vinegar; or of copper in Aqua Fortis, prepared as before directed, (a vessel of glass or earthen-ware being employed for this purpose) till they be of the colour desired.

Of Staining Ivory, Bone, and Horn, red.

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Take strong lime water, prepared as for other purposes; and the raspings of Brazil wood, in the proportion of half a pound to a gallon. Let them boil
for an hour, and then put in the ivory, &c. prepared by boiling in alum water in the manner above
directed for the yellow; and continue it there till it
be sufficiently coloured. If it be too crimson, or
verge toward the purple, it may be rendered more
scarlet, by dipping again in the alum water.

Of Raining Ivery, Bone, and Horn, blue.

Stain the ivory, &c. first green, according to the manner above directed; and then dip it in a solution of pearl-ashes made strong and boiling hor; but it must not be continued longer, nor dipt oftener, than is necessary to convert the green to blue.

The ivery, &c. may otherwise be boiled in the tincture of indigo prepared as by the dyers; and asterwards in the solution of tartar, made as is directed for the staining wood.

Of flaining Horn to imitate Tortoife-shell.

The horn to be stained must be first pressed into proper plates, or scales, or other flat form; and the sollowing mixture must then be prepared:

Take of quicklime two parts, and of litharge

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Put this paste over all the parts of the horn, except such as are proper to be lest transparent, in order to the greater resemblance of the tortoise-shell. The horn must then remain thus covered with the paste till it be thoroughly dry: when the paste being brushed off, the horn will be found partly opake, and partly transparent, in the manner of tortoise-shell; and when put over a foil, of the kind of laten, called officue, will be scarcely distinguishable from it. It requires some degree of sancy and judgment, to dispose of the paste in such a manner, as to form a variety of transparent parts of different magnitude and figure, to look like the effect of nature; and it will be an improvement to add semi-transparent parts.

This may be done by mixing whiting with some of the paste to weaken its operation in particular places; by which spots of a reddish brown will be produced; that, if properly interspersed, especially on the edges of the dark parts, will greatly increase as well the beauty of the work, as its similitude with

the real tortoife-shell.

To flain Ivory, Bone, and Horn, black.

Proceed in the same manner as is above directed? for wood.

Of staining Paper, or Parchment, of various Colours.

Of Staining Paper, or Parchment, yellow.

Paper may be stained yellow by the tincture of French berries, but a much more beautiful colour may be obtained by using the tincture of turmeric,

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formed by infusing an ounce or more of the root, powdered, in a pint of spirit of wine. This may be made to give any teint of yellow, from the lightest straw to the full colour, called French yellow; and will be equal in brightness even to the best dyed silks. If yellow be wanted of a warmer or redder cast, annatto, or dragon's blood, must be added to the tincture.

Of staining Paper, or Parchment, red.

Paper, or parchment, may be stained red, by treating it in the same manner as is directed for wood, or by red ink. It may also be stained of a scarlet hue by the tincture of dragon's blood in spirit of wine: but this will not be bright.

A very fine crimfon stain may be given to paper, by a tincture of Indian lake, which may be made, by infusing the lake some days in spirits of wine; and then pouring off the tincture from the dregs.

Of Staining Paper, or Parchment, green.

Paper, or parchment, may be stained green, by the solution of verdigrease in vinegar; or by the chrystals of verdigrease dissolved in water. As also by the solution of copper in Aqua Fortis, made by adding silings of copper gradually to the Aqua Fortis till no ebullition ensues; or spirit of salt may be used in the place of the Aqua Fortis.

Of Staining Paper, or Parchment, blue.

A blue colour may be given to paper, or parchment, by staining it green by any of the above-mentioned methods; and treating it afterwards as is directed for the staining wood blue, by the same

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means; or by indigo, in the manner there explained like wife way representable syrol, principation and before

elicitization de la company de Of staining Paper, or Parchment, orange.

Stain the paper, or parchment, first of a full vellow, by means of the tineture of turmeric, as above directed. Then brush it over with a solution of fixt alkaline falt, made by diffolving half an ounce of pearl-affres, or falt of tartar, in a quart of water. and filtering the folution.

Of staining Paper, or Parchment, purple.

Paper, or parchment, may be stained purple by orchal: or by the tincture of logwood, according to the method before directed for staining wood. The juice of ripe privet berries expressed will likewise give .. a purple dye to paper or parchment.

Of staining Alabaster, Marble, and other Stones, of various colours.

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Alabaster, marble, and other stones, may be stained of a yellow, red, green, blue, purple, black, or any of the compound colours, by the means above given for staining wood. But it is better when a strong tinge is wanted, to pour out the tincture, if made in water, boiling hot on the alabaster, &c. spreading it equally on every part, then to brush it over only; though that may be sufficient where a fighter die will suffice. When tinctures in spirit of wine are used, they must not be heated; as the spirit would evaporate, and leave the tinging gums in an undissolved state.

Where stones are not perfectly white, but partake of browness or greyness, the colour produced by the tinges will be proportionably wanting in brightness. Because the natural colour of the stone is not hid or covered by these tinges, but combines with them; and, for the same reason, if the stone be of any of the pure colours, the result will be a compound of such colour and that of the tinge.

The Art of Staining Glass.

s language Legis

To tinge Glass of a deep red.

Opake colours have a body, but the transparent' ones none; for which reason this deep red must be mixed with matters that give it one, as shall be shewn. Take twenty pounds of crystal frit, one pound of calcined tin; mix the whole well together, and put it into a pot, and fet it in a furnace that it may purify. When it is melted, cast in an ounce of calcined steel well pounded, and an ounce of scales of iron from the anvil well pulverised and mixed together; keep stirring the glass well with an iron stirrer while you are putting in the powder, to hinder it from rifing too much, You must take care not to put in too much of the powder, for that would make the glass black, whereas it ought to be clear, shining, and of an obscure yellow; then take about fix drachms of calcined copper prepared, cast it upon the melted glass, often mixing it two, three, or four times, and

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the glass will be as red as blood. If the colour be as you would have it, you must work it off presently, for fear it should turn black, and the colour be lest, of which great care must be taken; but if, notwithstanding this, the colour comes to be lost, you must add more scales of iron in powder, and it will return,

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To make a gold-yellow in Glafs.

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Gold colour, being one of the most noble and finest we can make, by reason of its imitating the most perfect metal in nature, must be made with the pureft materials and greatest precaution. Take two parts of crystal frit, made with tarfo, and not with fand, which is not fo good, and one part of frit, composed of two thirds of tarfo, and one third of fine falt of polverine prepared; pound and mix them well, and to each fifty pounds of this compofition, add half a pound of tartar purified, and pounded fine, and half a pound of manganese of Piedmont prepared, mixing these powders well with the two frits, because you must not cast them on the melted glass, as in other colours. Then put the whole, by little and little, into a pot, and fet them in a furnace, in which let them fland at an ordinary fire four days, for fear the glass rising should run over. When the matter is well purified, you may use it for making vessels, and what other works you please, which will be the fair colour. If you have a colour yet clearer, you must add more powder, and you will have a very fine golden colour. If you will have it yet finer, take fine chrystal frit, made of polverine of rochetta, and the golden colour will be yet more fair.

To give Glass the colour of lapis lazuli.

Lapis lazuli, which is a fine blue and full of veins

of gold, will not be easy to imitate, without a great deal of care and industry in its preparation. make this fine colour you must use the same matter as for the fine white; and when it is in fusion in the pot, you must add to it, by little and little, the blue enamel in powder, which is made use of by painters, mixing the whole well together each time, and that as often as there is occasion to make this colour: then try it, whether the colour is to your mind, and make a second essay of it; if the colour be perfect. let it stand ten hours, and then mix it again. If it keeps in the same state, without changing the colour, you may employ it in making what veffels you pleafe, which will be of the true colour of lapis lazuli. If in working this glass it happen to rife, you may cast in a little leaf gold, which will make the glass approach yet nearer to lapis lazuli, and which will in a moment stop the rifing of the metal, as fugar will do in boiling oil.

To make a marble colour in Glass.

White marble, being very simple, it is easy to initate; the way of doing it only requires crystal frit, which must be wrought as soon as it is melted, before it be purified, for so it will give a very fair marble colour.

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CHAP. XXV.

Of PYROTECHNY, or FIREWORKS.

To make a SKY-ROCKET.

ROVIDE yourself with a piece of good tough ash, or any other kind of wood that will not split; it must be fix inches long, and when turned. two inches diameter. It must be bored, and the diameter of the bore one inch. Besides this, you must have a foot or bottom to the mold, which must be turned in such a manner as just to fit the bore of the mold, viz. one inch; leaving the bottom part of the foot of the fame diameter as the mold, viz. two inches; and at the top of the foot which goes into the mold, must be turned a half ball, which is defigned for the bottom part of the rocket-case, or choak, to rest upon, and must be the same diameter as the roller on which you roll the paper in making the cases. In the centre of the half ball must be fixed a strong iron pin, which, from the top of the ball, must be better than three inches long; it must be made taper, and at the bottom about the thickness of a goofe quill; the upper end must have a small point; but fee that the pin has a regular taper, and also mind that it is fixed exactly in the centre of the half ball, fo that when the bottom is put to the mold, the point of the pin may be just in the middle of the bore. The design of this is to leave a hollow taper cavity when filled; and without which the rocket cannot possibly mount.

In the next place you must provide yourself with a roller to roll the paper on for making the cases. Let a turner turn you a piece of ash or box; it must be about eight inches long, and two thirds of an inch thick, on which must be rolled strong paper very tight till it will exactly fit the bore of the mold, which is done by having a board with a handle in the middle of it, fo that when you have rolled your paper as firm as you can with your hands, then lay your roller upon a table, and put the board upon it. and with the whole weight of your body, run the board forward four or five times, and you will find this will make your paper as firm and hard as poffible; but the rolling should be between every sheet of paper, with a little palte, which will make it firmer. The paper must be fix inches wide, or better, which is the length the rocket should be - You may make rockets of what fize you please (these are called the small ones, and are most commonly used) observing, that for every inch your rocket is made wide, it must be fix times as long: and the larger they are, the less quantity of powder is required.

When you have rolled paper enough on your reller, so as to fit the cavity of the mold, then draw forth your roller about an inch, and put in a short roller, which you must have for the purpose, about two or three inches long, and of the same thickness as the long one, leaving a space between them about half an inch, when the case is to be choaked, to straiten the cavity thereof; this is done by tying a piece of strong cord to a hook or staple in the wall, and take one turn round the space between the long and short roller, and choak it till the whole will just receive the taper pin; when done, tie it fast round with good strong pack thread: then draw out your rollers with care, and when dry, it is sit for use.

The mold and case being prepared, the next thing to be considered is the rammers to ram your composition with. You must get two pieces of good tough wood turned, so as with ease will pass up and down

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the case; the long one should be about seven inches, the other not above half that length, as the short one will be better to ram with when the case is near sull: they must be made hollow on account of the taper pin, which is fixed to the bottom of your mold, so that when you ram your composition, the hollow part of the rammer will receive the pin, by which mean the tocket, when filled, will have a hollow cavity near two thirds up it, which, as observed before, is the chief reason of its mounting.

We now come to consider the composition for filling these small rockets, as follows: Take twelve ounces of gunpowder, two ounces of saltpetre, half an ounce of stone sulphur, an ounce and a half of charcoal, all ground together, and sisted through a sine searge, so that no whole corns remain.—If you would have your rocket leave a long train put in a

little faltpetre grossly bruised.

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With this composition your cases must be filled, which is done in the following manner: Fix your mold and bottom together, then take the case and put it into the mold, and put down the long rammer; then give it a blow or two, to settle the paper in the mold, then proceed to fill it, by putting in about a tea spoonfull of the composition at a time, which must each time be rammed very hard with a mallet, till your case is full. Then draw your rocket gently out of the mold, lest you should crush or break it, which would cause it to burst in firing.

Your rocket being filled, it should next be ornamented with stars, to take fire when the rocket is burnt: to make which, mix three ounces of gunpowder, one ounce of saltpetre, and a little crude antimony, all beaten to fine powder; moissen them with gum water, and form them into little balls about the size of a nut, dry them in an oven or by the sire; inclose four or sive of them on the top of your rocket, which is done by having a short case of paper just to sit the upper part of the rocket; when you have put in your stars, inclose the top of the case.—Some

fix a conical cap on the top to make it pierce the air

more quick.

To make the rocket mount straight up, it must be tied fast to a long stender stick, eight times its length; you must poife it, by laying it on your finger about an inch from the mouth, and if you find the flick too heavy, cut it off, till the flick preponderates a little; for was the rocket to over-balance the flick, it would not rife up, but tumble about in a strange manner.

To fire your rocket, take some cotton wick, washed in gunpowder and water, let it be well dried, and cut it into lengths of about three inches; take one of these and put it up the hollow part of your rocket, leaving the end to hang a little below the mouth; hang your rocket at freedom on a wall or post, and fet fire to the fuzee, and if it has been properly managed, it will mount up to a confiderable height.-If you find the rocket burn out too fierce, or burst in mounting, add a little powdered charcoal to the composition; and if too weak, add some mealed gunbowder.

SERPENTS are a kind of small rocket, and chiefly fired out of the hand; if you make them properly they exhibit a beautiful appearance, and will run backward and forward on the ground in a very curious manner.

The method of making them is nearly the fame as the fky-rocket, observing that the bore of your ferpent mold should be only half an inch, and the length fix or feven inches: the bottom of the mold should be turned in the fame manner, but observe it must be no more than half the thickness; there is no necellity of an iron pin in making serpents, as they are not designed to mount up

The thickness of the roller to make the cases should be about the fize of a good large reed, and and othe With penc

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the rammer fomewhat fmaller: a rammer made of fron is much the best, as one of wood is rather too weak to ram them well. The serpent case must also be choaked, leaving only a very small cavity to re-

ceive a large knitting needle.

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When your case is within two thirds of being full. then fill it up with corn powder, and secure the end as fast as possible, some only fill them half full of the composition, and put in more powder to make the report greater. When the serpent is filled, and taken out of the case, fill the cup where it is choaked with a composition somewhat weaker, for priming; and tie a piece of touch paper round the end, to prevent the priming from falling out.

The composition for making serpents should be, one pound of gunpowder, two ounces of charcoal. and a few seel filings to make it sparkle the more. Some also use a little saltpetre, which is not amis;

let them all be ground very fine and fifted.

Of FIRE-WHEELS.

Of these there are three forts, viz. fingle, double, and triple: some of their fellies are of a circular form, others hexagonal, or decagonal; fome like a ftar without fellies. Most of these are made to run perpendicular to the earth, others parallel; and all may be ordered to as to serve on land or water.

The fire wheels that are to be used on land, turn on an iron pin or bolt, drawn or screwed into a post; the nave is turned of close or firm wood, in which the joiners glue the spokes according to the number of the fellies, which must be carefully joined together: then have a groove hollowed round, so deep that the rocket or case may be about half lodged therein.

The double wheels must have their fellies turned fronger and wider, with a groove for the rockets, not only at top, but also on one side thereof, incli-

ning the necks of the tockets at top to the right hand, and those of the fides to the left, lode and those of the fides to the left, lode and the left of the left.

A triple wheel has a groove at top, and one at each fide; the matches are laid from one groove and rocket to another, with small pipes filled with meal powdet. You may also make a triple wheel on a long nave, and observe the placing of the rockets on each, contrary one to the other; and the communication you are to make with small pipes, which, after they are fixed, you are to cover and glue over with paper.

Your rockets being ready, and cut behind a little shelving, bore them: the first three diameters off its orifice; the fecond two and three quarters, the third two and a quarter; the fourth two diameters, the fifth one and three quarters, the fixth one and a half; the feventh one and a quarter, the eighth one diameter; always the latter fomething shorter than the preceding; after this, they are primed with meal powder, worked up with brandy; and when dry, glued in the grooves before described. You must bear the first fired rocket's neck up above the rest, underlaying it with a tim plate, or any thing elfe: the fame must be observed in the last fired one, wherein you put the charge of a report. You may also glue, on every end of the rockets, a report of paper, with small copper pipes or goofe quills, which are fixed one end in the rocket, and the other in the report. When all is dry, then you may cover your wheel, on one or both fides, with linen or paper, in what form you would have it. The horizontal, or parallel wheels, are made like the others, with fellies, or of one entire piece: their grooves are furnished with rockets, and their planes with crackers.

Of WATER-BALLS.

Balls in fireworks are of different forms; some are globular, some aval, some conical, some cyrindrical, and others in the shape of a pendant or drop. The

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Ta the he ped; water-balls are commonly made of knitted cord bags, or of wood; those made of bags are shaped like oftriches eggs, and are filled with their proper charge, the outfide is dipped in glue, and wound about with hemp or flax, till it is a quarter of an inch thick thereon; this ball is then coated over with cloth, and about the touch-hole, glued over with a piece of leather; the touch hole is bored with a gimlet, and stopped with a wooden peg; at the bottom of the ball, pierce a small hole through to the composition, in which fasten a small copper pipe, furnished with a paper report, together with a leaden balance; glue the report fast to the ball, then dip the ball in melted pitch, open the touch-hole, and prime it with a quick burning charge. These balls keep a long time under water before they rife, and, if a true balance: is not observed in the lead, or the ball be over-charged, they will fink to the bottom and burn out; therefore you must well observe, that when a waterball, without the balance is two pound weight, you must give it four, or four ounces and a half of lead; but, if it weighs one pound and a half, balance it with three, or three ounces and a half.

Charge for the FIRE-BALL.

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For every pound of powder, take eight ounces of took water, four ounces of fulphur, two ounces of camphire, one ounce of oil of petre, one ounce of linfeed oil, half an ounce of oil of fpike, and two ounces of colophonia.

How to make Fireworks to run upon a line backward or forward.

Take small rockets, and place the tail of one to the head of the other, tying a cane to run on a line sloped; the line may be a hundred yards long, or long-

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er if desired, being well stretched and set on stakes; and at last (if you please) may be placed a pot of streworks, which being fired off will make good sport; having serpents and other things in it, which will variously intermix themselves in the air, and upon the ground, and every one will extinguish itself with the report.

How to make a CRACKER.

TSACCE TERM A DESTRE Take of strong cartridge paper, a piece fix inches wide the length of the sheet, and fold down the breadth of three quarters of an inch, then double back half that breadth to crease the paper, open that double again, and put in your charge, which must be meal powder, and for your fuzee take a piece of cotton wool rolled in meal powder, and place it in the end before you proceed to fold up your paper, that it may not be lost: then close the double you opened, very flat, which will prevent the powder from escaping into other folds, then roll it up one double after another, pressing each fold down with the hand to make it smooth and flat, till you have rolled up all the paper: then proceed to fold up the length of the paper (first securing one end of the cracker fo as no powder can get out) about two inches long each fold, till you have folded the whole, then twitch all the parts together with fine strong twine, and then once between each double, in order to make it look neat, then beat it flat with a hammer; and when fired, if well managed, according to the above directions, you will have a good explosion between each fold.

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son bus six back H.A.P. I XXVI my virobing Him on the ground; and everyone will defined to asking भूप का राजित नहां, रहाता पांचीर का है वह मान्त्रने जिता तीरोड़

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HE most just and regular idea we can form of the Porcelain, or China Ware is, that it is an half vitrified fubstance, or manufacture, in a middle state between the common-baked earthen-ware of our vulgar manufactures and true glass; this is the effential and diffinguishing character of Porcelain, and it is only by confidering it in this light, that we are to hope to arrive at the perfect art of imitating it in Europe.

This attempt is to be made on these principles, and in two different manners; The one, by finding fome appropriated matter, on which fire acts with more than ordinary strength, in the time of its pasfing from the common baked state of earthen ware into that of a glass; the other is to compose a paste of two substances reduced to powder, the one of which shall be of force to refift a very violent fire, so as not to become vitrified in it; and the other of a matter easily vitrisiable: in the first case the matter is to be taken out of the fire, at the time when it is imperfectly vitrified; and in the other the compound mass is to remain in the surface till the one substance, which is the more easily vitrifiable, is truly vitrified, and being then taken out, the whole will be like what Porcelain is, a substance in part vitrisied, but not wholly fo.

The first method is that by which the European Porcelain has generally been made, and though that of St Cloude and some other places has been very beautiful, yet it is always eafy to distinguish even the finest of it from China ware, and the nature of the two substances appears evidently different; these owing all their beauty to their near approach to vitrification, are made to endure a long and violent fire, and are taken from it at a time when a very little longer continuance would have made them perfect glass; on the contrary, the China ware being made of a paste, part of which is made of a substance in itself scarce possible to be vitrified, bears the fire in a yet much more intense degree of heat than ours, and is in no danger of running wholly into glass from it.

The two substances, used by the Chinese, are well known by the names of petuntse and kaolin; and on examining these, it appears very evident, that we have in Europe the very same substances, or, at least, substances of the very same nature, and capable of being wrought into a Porcelain equally beautiful and sine.

These are the two different semi fitrifications, on one or other of which all the European manufactures have hitherto been founded; and it is easy, from the knowledge of thefe two principles, to determine, on breaking a piece of the China of our manufacture, by which of the two processes it is made. It is done by fizing the half vitrified mass of a substance which would foon after have been wholly vitrified; then the putting it in a crucible, into an equal degree of fire, will foon turn it wholly into glass; this is the case of most of our European Por-But, if it is made of two ingredients, the one of which is not vitrifiable, or at least not by fuch fires, then the matter will melt, but will not vitrify; this is the case with the Chinese Porcelain, which is kept in fusion a long time, yet, when cold, is China

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ware still, fo that this is evidently made of two fuch Porcelain has generally been made, and theibirgini

Belides these methods, yet there is another of late invention which makes a very beautiful China, and which, if it does not afford veffels equal to those of China, yet will afford them nearly approaching to those, and at a confiderably smaller price : This method confifts in reducing glass to China. In collection,

The fine deep blue of the old Porcelain ware of China is much valued by the curious, and it is much lamented that the same colour is not used at this

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The art feems at present to be loft, but perhaps it might be recovered by trials; it is certain, that the Chinese have cobalt among them, and very probably they used a blue colour prepared from this, before they had any commerce with us; notwithstanding all the conjectures about their materials for colouring, this feems the most probable substance; and there is a way of preparing a colour from this, much superior to that now in use, which we call smalt.

- Cobalt is a mineral containing arfenic and a vitrifiable earth. The common way of preparing smalt is, by roasting this cobalt in a reverberatory fire. This disposes it to vitrify, and drives off the arsenic it contains in fumes, which, collecting at the top, forms true flowers of arfenic. It is very certain however from experiments, that, if this arienic could be prefented by the cobalt, the smalt would be of a much finer colour; for there are some kinds of cobalt which yield fmalt without previous roafting, and, as the arsenic is in a great measure contained in these, the finalts are much finer coloured. Arfenic, added to fmalt while in fusion, greatly exalts in colour alfo; and there is a way of procuring finalt from cobalt without fire, only by diffolving it in an acid, and precipitating that folution with oil of tartar; the fmalt, thus precipitated to the bottom, is of a much finer colour than any prepared by fire, but it is much more expensive, and prepared in less quantity. It is very possible that the Chinese might have the art of making this kind of smalt before they knew us, and that to this was owing the fine blue of their Porcelain ware; but when we trassicked with them, and they purchased smalt so much cheaper of us than they could make it themselves, they naturally discontinued the manufacture of their own finer kind, without considering how greatly inferior that colour was, which the other yielded. If this be the case, it will be easy to revive this other art; and the adding the true old China blue to our European manufactures, in imitation of Porcelain, may give them a value which

they have not at present.

The Chinese had once a method of painting the figures of fishes and other things on the inside of their vessels, in such a manner, that they did not appear till the vessel was filled with water, or some other clear liquor; they called this fort of China ware kialsim, that is to fay, the concealed blue China. The art is now in a great measure lost, but there may be some guess made at the manner in which it might be done at this time. The vessels that are made in this manner, must be very thin; the colour must be laid on in the form of the fish, or other animals, or figures, on the infide, after the veffel has been once baked; after this colour has had time to dry, the infide of the vessel must have a second colour of the same earth, or stone of which the vessel is made, and over this a varnish of the common kind; the consequence of this will be, that the figures of the fish in a very strong colour will be buried between two coats of the ware, which together form a complete veffel; the outfide is then to be ground down almost to the figures, and when they begin to appear, a new coat of varnish may be laid over this; the figures will then be obscure, and searce, if at all perceivable; but, on filling the vessel with water, the transparency of the fides will be taken off, and the liquor will make a fort of foil behind, which will throw out the figures of the fish; this might be done in any ware clear and

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The Chinese make a variety of figures on the surfaces of the vales of white China ware, and there is one kind of this greatly in esteem among them, in which there are flowers and other figures, yet the furface is quite smooth, and the substance extremely thin; the manner of making it is this: They first form the veffel of the finest materials as thin as they can; then, when they have polished it inside and out at the wheel, they put it into a stump of its own shape, but cut with all these figures; they press this down to firmly on this yet moist vessel, that the impression is received in a very perfect manner; and if the shape of the vessel be at all lost, they take it to the wheel again to restore it: they then finish it with the knife and sciffars, and, when they have made it as perfect as can be, they cover it with a fine white varnish within and without; this fills up all the cavities of the impression, and gives a perfectly smooth and even furface; yet the thickness of this varnish in the traces of the figures give it a different white, and the whole figures are as finely and accurately feen as if painted on the outlide; this is an artifice that might eafily be brought to bear among us, and feveral of our finer wares would make a pretty figure with it:

There is a current opinion among the Chinese themselves, that the Porcelain ware, of sormer times, was greatly superior to that which they make at present; and that the burying China in the earth for a long time adds to its beauty; but all this is sounded on error. The truth is, that our merchants beat down the price of their ware, and thereby compel them to make a worse kind in general; but they are able to do as fine things now as ever.

What gave birth to the opinion, that burying the Porcelain made it good was, that finer pieces than ordinary are fometimes found buried; these are all

precious vales which the poffesfors bury by way of fecurity, in the times of civil war; and it is no wonder that there are none but the finest kind found buried on these occasions. To make a state also the same

Staining or colouring Porcelain.

the site the late two sees at theory with the

former and rate value of this of the const

The Chinese, for a great many ages, used only white Porcelain; the frist colour they employed was blue, and, after that, made use of many more; the ancient blues were prepared by themselves from a kind of lapiz lazuli, but we now supply them with the fmalt fo much cheaper, that it is no longer worth their while to make it themselves; they used to prepare this only by giving a gentle calcination to the stone, and then beating it to powder, and grinding it to the utmost fineness in mortars of unglased Porcelain ware with peftles of the fame. The red, that the Chinese use, is made of our green vitriol, or common copperas; they put about a pound of this into a crucible, and lute on this another crucible inverted; this last has a hole cut in the top, which they keep covered or open at pleafure; they fet this crucible in a furnace of bricks fo contrived, as to throw ing wall the flames upon the lower veffel, in the way of beaut all the flames upon the lower veffel, in the way of our chemists reverberatory furnaces; they make a large fire of charcoal all round it, and observe the hole at the top; for so long as there ascend thick black fumes through that, the matter is not sufficiently calcined, they watch the going off of this sume, and, when there appears in the place a sine and thin cloud, they take away the crucible; the matter being then sufficiently burnt, they try this however by taking a little out and examining the colour; if it be not sufficiently red, they let it remain longer in the fire; as a fix when they find that it is of a good colour, they take away the fire, and leave the vessel to cool; this done, they find a cake of red matter at the bottom of the hat or crucible, and a quantity of finer powder about its some crucible, and a quantity of finer powder about its from

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fides; they keep these separate, the latter being the pureft, the finest, and the brightest colour; one pound of copperas affords about four ounces of this colour, and this is the red, which they manage in

different shades and vary so much.

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The Chinese have also a white colour, which they use in their figures painted on the China; the ware itself is naturally white, and the varnish, or oil of stone, is a great addition to its whiteness all over. But they have yet another way of making a much finer and brighter than these, as may be seen in most of the fine China ware, where there is any white in the figures; this white is made in the following manner: They collect on the shores of their rivers a fort of agate, which is of a whitish hue, without veins, and tolerably transparent; it approaches very much to the nature of chrystal, and probably christal may be found to supply its place with us; they calcine this stone to white powder, and to every ounce of this, when ground in Porcelain mortars to an impalpable finencis, they add two ounces of ceruis in fine powder, this they mix with varnish, and lay on in the common way of other colours.

This white mixture ferves not only for the colouring white, but it is the basis of several other of those leautiful colours which we see on the China ware, md which our manufacturers have been often perpiexed what to make of; their green colour is made ck of copper rusted with acid; and the fine deep violer al- solour is made of this green, by adding to it a due nd, proportion of white; it is not to be supposed, that id, this effect is to be produced according to the common en laws of mixing colours among painters, for then the g a white and the green would only make a paler green; uf- but copper being a metal that as well gives a fine blue re; is a fine green, according to the nature of the subake lances it agrees with, the white in this case alters ne, he very nature of the green, and converts it into its from copper by means of any of those volatile alca-

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lies, fuch as spirit of sal armoniac, spirits of hartthorn, spirit of arine, or any the like liquor .- The workmen know bow to bring this blue to any degree, by putting in different proportions of each colour: there is not any admixture of them that will not produce a blue of some kind, but always the more of the green colour is used, the deeper the blue is, and the less the paler; the yellow is made by an admixture of feven drachms of this white, and three of copperas, or more, if they defire the colour to be deeper. from mers one green anothersque

These colours are laid on upon the vessel, when they have been once baked; but they do not appear, till the fecond baking is over, in their proper shades

and tinges, and fometimes scarce at all.

The black China is much esteemed in the east, and particularly when it is ornamented with gold, this colour looking better with that ornament than any other; the black is always laid on when the Porcelain is first dried, and is prepared by mixing of a fine deep blue, with seven ounces of that fine varnish, which they call oil of stones. This admixture gives a deep black, when the colour is thoroughly dry, the veffels are baked, and when this is done, the gold is laid on, and the whole is baked again in a particular furnace made for that purpose; if they would have the black degenerate into blue, they need only add cauf the less of the blue, and a little of the cerus, or a four gate white before described. They have two peculiar ways of applying the red, besides the common one thers both which require a nice workman, and make the eft ! ware come very dear; they call one of these oils red, furns and the other brown red. in, f

in their colouring and forming the feveral kinds of aid

Porcelain, which may be brought into use among us Thus One kind of colouring easily introduced among us the g would be what they call hoan ton hoan; this produce mix to ces vessels of great beauty and price, and is done it powd this manner: The matter of which vessels are made parate

for this purpose, need not be very fine; they usually take any of the common veffels baked, without having been varnished, and consequently simply white. and without luftre! when thefe are intended to be of one simple colour, they need only be plunged into a liquid varnish or oil, as the workmen there call it, coloured with fuch ingredients as will ftrike the most lively tinges: but if it is to be coloured in compartments, as is usually the custom with this fort of China, it is to be done by the pencil; the usual way is to paint these in pannels, one green, another blue, and fo on; and they make a very agreeable appear-

There requireth no more to this, than the laying on the colours tolerably thick with a large pencil: but if the pictures of animals and plants are to be given, they are to be done with the most permanent colours, and the veffel being again well baked, be-

comes very beautiful.

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The Chinese who are deceivers in every thing, find the way of cheating very much, in regard to this fort of China ware; they paint the flowers of plants, and some parts of the birds, &c. in very bright colours, after the vessel has been baked. Vermillion alar is a fine colour, which they often add on this occafon; but they cannot use this before the baking, beadd cause it would be destroyed by the fire; these co-fours, which are laid on afterwards, cannot last, but uli foon rub off in wiping, or using the things; the othe est heat of all, the vessels being put into the same red, furnaces to lay on these as the other things are baked in, for the first time. Saltpetre and powder of flints sold aid on, to make them penetrate and run properly. Thus for the fine deep violet colour, which makes the greatest figure of all others; on this ware they odu mix together equal quantities of the fine azure, the se it powder of slints, and saltpetre, all first powdered se made parately, till perfectly fine: this is tempered with

E e 2

water, and then laid on with the pencil; and tho' it looks rough at first, it comes out of the furnace of as beautiful a glossy hue, as any thing that can be conceived. The yellow is made by mixing together three ounces of cerus, and three ounces of powdered flints, and adding three, four, or more drachms of the red copperas, till the whole is of a proper degree of colour. The white is composed only of powder of slints and cerus, with a small admixture of the saltpetre, or it will succeed tolerably well without; these are all the particulars necessary to be observed for the making a fort of Porcelain of great beauty, in which the nature of the ware itself is not concerned; so that it seems easy to imitate it with a-

ny of our own wares.

In the baking of this or any other kind of coloured China, the fecond time, there is however fome caution to be used in the placing of the pieces; the Chinese are very curious in their disposition of these, arranging them in the most compact manner, and putting the little ones within the great ones; great care is also necessary, that the vessels do not touch one another in the parts where they are painted, for the consequence of that would be the spoiling of both veffels, as the colours would run together; the botrom of one velfel may generally be placed on the bottom of another, though both are painted; because the rims are not painted, and they keep the painted parts from touching one another. High and narrow veffels, fuch as chocolate cups, &c. are very troublefome on this occasion; the method the Chinese workmen take with them is this: They place a range of them fo as to cover the whole bottom of the furnace, and they cover this with a thin bed of broad China ware, over which they place a thin row of cups, and fo on to the top, where they lay on covering; they never bake any thing elfe with those cups, when they are of this kind of twice baked Porcelain. about flor bott tor is I bless ant Marcison bu

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Secrets relative to METALS. der of times and cerufs with a small admixture of

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A secret to cause the transmutation of iron into the finest German feel.

AKE of clean foot one pound, oak-wood ashes. twelve ounces, and four of pounded garlick. Boil all together in twelve pounds of common water, reduced to a third, or four pounds. Strain this, and dip in it the iron pegs, which you will afterwards stratify with the following cement:

Take burnt wood's coals, otherwife called cokes, and quick lime, of each three pound; foot dried, and calcined in an iron pan, one pound; decrepitate falt four ounces. Make of this and your iron feveral beds alternately one over another; and, having well luted the veffels in which you shall have made those beds of iron and cement, give them a reverberating fire, for three times twenty four hours, and the operation is done.

To make Tin.

Take a diferetionable quantity of rye bran quite ney pure, boil it a minute or two in vinegar, then add ney to it a little water, and in that same instant plunge your sheets of black iron; then take out of the fire, and stop well, the vessel. Let your iron rest there and foak for twenty-four hours, after which time

take off your iron sheets; scour them well with the very bran with which they have been soaking, then rub them over a little with grindstones. This being done, let them soak again in a water wherein you shall have dissolved some armoniac salt, whence, having taken them off, set them to drain, and rub them afterwards with rye-bran, and your tin will be done.

Observe that the vessel in which you lay your sheets to soak, must be large enough to receive them

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in their full intended fize.

To compose a metal of a Gold colour.

Take refiner's copper fix ounces: melt it in a erucible; add one ounce of calaminary ftone, half an ounce of tutty, and one of terra merita, in powder. Give to this a melting fire for five or fix hours running, and no more; then take off the crucible from the fire. Put this composition in powder, and add to it two ounces of common mercury, fix of fea-falt exficcated, and a sufficient quantity of water. Set the whole a boiling, until there appear no more mercury. Then put the matter into a crucible, and place it between two fires of kindled coals, avoiding carefully the breathing of the fumes. Give this a melting fire for two hours, then wash the composition in water till this runs off quite clear. Set this again in a crucible; and, when melted, pour it into an ingot, This will give you a metal of the most beautiful gold colour which can be defired, and which you may make use of for plates, buckles, fnuff-boxes, caneheads, &c. But we cannot recommend too much the avoiding of breathing the fumes of this composition while it is making.

To increase the virtues of a Loadsone.

Soak it forty days in iron oil.

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Take pearl-ashes one pound, vine-ashes four, quick lime one, and pebbles calcinated two. Make a strong Iye of the whole with distilled vinegar. Dissolve in this two pounds of lead: and, when the Iye is become white, throw in two ounces of borax. When this is dissolved, throw the whole into a retort, and distil it with a gradual fire. You will get into the receiver ten ounces, at least, of quicksilver.

Permutation of Lead into Silver.

Take fine lead; calcine it with common falt, or else with that fort of salt which is extracted from the dregs of faces, or caput mortuum of saltpetre, and vitriol calcined both together. Soak the whole warmly with oil of vitriol, till you make it come into an unctious paste. This you will put into a pot or crucible well luted, and placed in a pan full of sand, with which you will cover it over entirely. Make under this a digesting fire; that is to say, such a fire as is necessary to warm the sand: keep it so for ten days, then take off your matter and test it. Cut off one hundred and five pounds weight of lead, you will draw five marcs, or two pounds and an half weight of silver capable to stand the test.

Transmutation of Iron into Copper.

Iron is easily changed into copper, by means of the vitriol. To do this, you put your iron stratum super stratum in a descensorium, and set it over a strong blast fire, pussed by bellows, till the iron melts and slows into copper. You must not forget when you have made your beds of vitriol, to water them a little

over with vinegar faturated of faltpetre, alkaline; tartar falts, and verdigreafe.

To preserve the brightness of Arms.

Rub them with hart's marrow; or else dissolve fine alum powder with the strongest vinegar you can find, (that of Montpelier which serves to make their famous verdigrease is the sittest) and rub your arms with it. By these means they keep for ever bright and shining.

To Soften Steel.

Take a discretionable quantity of garlie, rob them of their coarsest peel, then boil them in oil of nuts till reduced into an unquentum. Cover well your steel all over with that composition to the thickness of half a crown. When this is done, put your steel, thus covered, in the forge, in the live coals, and it will become soft. To restore it afterwards to the temper, called by artists red cherry colour, you must, after having made it red hot, plunge it into the coldest water.

To imitate Tortoife Shell on Copper.

Rub copper laminas over with oil of nuts, then dry them over a flow fire, supported by their extremities, upon small iron bars.

of the state of To perform the same on Horn.

Make a cold diffolution of auripigment in filtered lime water: then lay fome of this liquor with a brush on your comb or other horn work. Reite-

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rate this, if you find it has not penetrated enough the first time, and turn it to do the same on the other side.

erlonie sile in To foften Metals.

Take saltpetre and camphire of each an equal quantity. Dissolve them in a lye made with two parts of oak-wood ashes and one of quick lime. Pass this solution thro' a filtering paper, and vaporise it over a slow fire in a glass vessel. There results a borax which, thrown in metals while in susion, sostens them perfectly.

To wash Brass Figures over with Silver.

manifer and the property with a material within

Take one ounce of Aquafortis; dissolve in it over a moderate fire one drachm of good silver cut small, or granulated. This silver being wholly dissolved, take the vessel off from the fire, and throw in it as much white tartar as is required to absolve all the liquor. The rest is a paste with which you may subover any work made of copper, and which will give it the colour of silver.

To take immediately ruft from Iron.

Rub your iron with a piece of rag steeped into oil of tartar per deliquium.

structure of the contract of the state of th

To obtain good Silver from Pewter.

Take quick lime made from roch or transparent pebbles, and one pound of common salt. With those two ingredients make a strong lye, which you will evaporate on the fire to the reduction of a third part of what it made before. Next, melt in a crucible two 334 The SCHOOL of WISDOM; or,

pounds of pewter, to which, after fusion, you will add one pound of bæmatites. The whole being well incorporated and melted, throw it into part of your aforesaid lye: and, when quite cold, melt it again, and throw it again into new lye, repeating the same process for seven different times, and using fresh lye, prepared as above, every time.

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copper, which you will melt; then thirdwieverit three gogges, sefued parliment for they can be street that he

Take half an ounce of tartar, two of common falt, and two and a half of verdigrease: Mix all together and expose it in a porringer to the dew of nine nights running. This will turn into water, in which, when red hot, you may kill your iron.

To soften all Sorts of Metals.

Take fublimated mercury, cuphorbium, borax, and armoniae falt, of each equal parts pulverised. Project some of that powder over any metal when in a state of susion, and you will obtain the desired effect of making it soft.

A good Temper for Arms.

Take nettle's juice, bullocks gall, child's water, or strong vinegar, and a little salt; Incorporate well all this together, and plunge any red-hot iron into it.

To whiten Iron like Silver.

Melt iron filings in a crucible, along with realgar or red arsenic. Then take one ounce of that matter, and one of copper; melt altogether, and put it in to a copper. It will give you one ounce of good fiver in the whole sites in the whole being add one pound of be mariter. The whole being add one pound of be mariter.

A Spirit which will diffolve all forts of Stones, without and and encepting the most bard and roll also to

incorporated and meited, throw it into part of your

Take one pound of decapitated, or well purified copper, which you will melt; then throw over it three pounds of refined pewter. As foon as they shall be both in good susion, add six ounces of calcined red tartar, two of arsenic, half an ounce of saltpetre, and two drachms of alum. Leave all this in susion together, for the space of three or four hours, that all the salts may well evaporate, then you will cast this composition in the slat sand mould prepared for it.

To guard Iron against rusting.

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Warm your iron till you can no more touch it without burning yourself. Then rub it with new clean white wax. Put it again to the fire, till it has soaked in the wax. When done, rub it over with a piece of serge, and the iron will be preserved from rusting.

To cut pebbles with eafe.

Boil them a good while in some mutton suet; and then you will cut them very easily.

To calcine Pewter, and render it as white and as hard as Silver.

Melt well your pewter in a crucible, fo that it may be very fine and clear. Pour it afterwards into a very strong vinegar, then into mercurial water. Repeat that operation as many times as you please, you will each time give it an additional degree of hardness and whiteness, drawing near to silver; so much, that it will, at last, be very dishcult to distinguish it from silver itself.

To Colour Metal like Gold.

Take fal armoniac, white vitriol, rock falt, and verdigrease, of each a like quantity in fine powder; lay it upon the metal; then put it into the fire for an hour, take it out, and quench it in urine, and the metal will have the colour of gold.

To melt Metals quickly.

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Put in a layer or course of the powder of any metal into a crucible; then lay upon it a layer of sulphur, saltpetre, and saw-dust of each an equal quantity, mixed together; put a little fire to it, and the metal will immediately be in a mass.

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SPECIFIC WEIGHT OF METALS.

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Quickfil	er 14091	Tin	7321
Lead	11344	Stone	2000
Silver	105135	Water	1000
Copper	8843	Air	Complete in

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The Cubic Inch of Ounces. Drachms. Grains.

Gold	1	12	2	52
Quickfilver	i	8	6	8
Lead	weighs	7	3	30
Silver	} .50	6	5	28
Copper		5	6	36
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Tin	J .	4	6	17

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of all known bodies they are the heaviest.

bus plus daidw resibod listo slamit sons a star a Meht become fluid by fire, and coagulate by cold, and harden into a folid mass, capable of distending under the hammer.

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A Metal is faid to be simple, as it may be affirmed of every the minutest particle of a metal, e. gr. a grain of gold, that it is gold, or has all the proper-

A Metal is fufible by fire; that is, when exposed to a great fire, it diffolves into parts, which are eafily moveable among themselves, or are actually in

A metal is fixed, that is, it bears the fire without -flying off in vapours. Though metals are fixed only to a certain degree; for by the large burning-glasses of M. Tischernhausen and Vilette, all metals will

readily evaporate.

water and gold Such are the proper characteristics of metals, which are no ways applicable to any other bodies in nature: for a diamond, or other stone, though it be a simple body, yet is not fulible in the fire, nor capable of being extended under the hammer; and the falt, being dissoluble by fire, is not malleable, but will break under the hammer.

There are indeed certain woods which yield in fome measure to the hammer; but then they fall to

dust in the fire, and so of the rest.

There are but fix metals found in all nature, viz.

gold, filver, copper, tin, lead, and iron.

To these is usually added a seventh metal, namely, mercury, or quickfilver, but improperly, as it has not all the characters of a metal, nor scarce any thing in common with the other metals, except weight and similarity of parts.

Thus, for example, it is neither dissoluble by fire, malleable, nor fixed; And, in reality, it feems to constitute a peculiar class of fossils, and is rather the mother or basis of all metals, than a metal itself.

The common radical character of metals are, that

of all known bodies they are the heaviest.

By the experiments made by Dr Halley, the weight of gold to that of glass is determined to be as seven to one; and the weight of tin the lightest of all metals, to that of gold, as seven to nineteen; which considerably surpasses the weight of all stones, marbles, gems, and other the most solid bodies, as appears from the tables of specific gravities.

Nor is there any body in nature, but a metal, that

is one third of the weight of gold. It as and A

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The Royal Society furnish us with various experi-

The weights of the feveral metals and other folids they have examined hydrostatically, by weighing them in air and water; and the weight by the fluids,

by weighing an equal portion of each.

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By such experiments they find, that, taking the same weights of water and gold, the bulk or magnitude of the water is to that of gold, as 19636 to 1000; consequently that the weight of gold is nearly nineteen to one.

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